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ON REST AND PAIN.

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ON REST AND PAIN:

A Course of Lectures

ON THE INFLUENCE OF MECHANICAL AND PHYSIOLOGICAL REST IN THE TREATMENT OF ACCIDENTS AND SURGICAL DISEASES,

AND THE

DIAGNOSTIC VALUE OF PAIN.

DELIVERED AT THE ROYAL COLLEGE OF SURGEONS OF ENGLAND
IN THE YEARS 1860, 1861, AND 1862.

BY

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PREFACE.

The first edition of these lectures was published, soon after their delivery, at the express request of some who had read them as they appeared at intervals in the weekly journals, and by many others who desired to have them gathered into a separate form. The first edition, in which I had the kindly and liberal help of my personal friends, Dr. Daldy and Mr. Durham, at that time Demonstrator of Anatomy at Guy's Hospital, was soon out of print. It was my intention at that time to have enlarged the volume by additional matter derived from other and different surgical diseases, but all having the same purpose in view—namely, to show how largely we are indebted for our professional success in surgical practice to the recuperative power of Nature, especially when helped by the suggestions of a thoughtful surgeon. But, on carefully scrutinizing the materials, I foresaw what appeared to be insuperable difficulties; and since then, from one cause or another, I have allowed the reappearance of these lectures to be from time to time deferred. As, however, I have lately been assured, on repeated occasions, that a second edition would be welcome and useful to many, I have submitted the lectures to the careful and judicious editorial guidance of Mr. Jacobson, who has conferred on me a great obligation for the work he has now so well accomplished, with the slight aid of my own occasional assistance and supervision.

It will give me great pleasure and satisfaction to know that the republication of these lectures will be useful to the students at Guy's Hospital, where I emphatically taught by lectures, and demonstrated clinically in my wards, the therapeutic value of mechanical and physiological rest in surgery.

10 New Broad Street,
September 1st, 1876.

EDITOR'S NOTE.

When I was asked, a few months ago, to undertake the editing of this book, I agreed to do so in the hope that I might thus render a good service to students, more especially to those at Guy's. Two years' experience of teaching in the dissecting-room has taught me that such a book might be pre-eminently useful to students, by proving to them, when engaged in the earlier drudgery of dissecting, how useful the dry facts of anatomy will surely be hereafter; and later on by encouraging them, when busy in the wards, to keep up their knowledge of anatomy by applying to their practice the thoughtful lessons with which these pages abound.

I avail myself of this opportunity to thank Mr. Wesley for the trouble which he has taken, both in drawing the new and in altering some of the old woodcuts. More would have been done in this direction had it not been thought of more importance that the price of the book should be materially diminished.

31 Finsbury Square,
September, 1876.

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ON THE

THERAPEUTIC INFLUENCE OF REST

AND THE

DIAGNOSTIC VALUE OF PAIN

IN

ACCIDENTS AND SURGICAL DISEASES.

LECTURE I.

The Influence of Natural Therapeutics—Rest the Chief Natural Therapeutic—Object of Pain—Rest the Fosterer of Repair—Rest Necessary for the Healthy Action of any Organ—Means Adopted by Nature to Secure a State of Quiescence to the Various Viscera.

Mr. President and Gentlemen,—There are duties which are difficult of fulfilment pertaining to every position in life; and there are duties attached to public professional life, from which no man can assume to himself the right to shrink, with whatever diffidence and feeling of incapacity they may be undertaken. In this duteous but self-mistrustful spirit I have ventured to accept, at the request of my colleagues in the Council of this College, this Professorial appointment—this, in my estimation, highly honorable appointment—the requirements of which I must now proceed to carry out as best I can. To this end it is desirable to set out with a clear conception of its objects and intentions. I conceive that the institution of these lectures was based—firstly, on the wise recognition of the fact that there is much in surgery which cannot be systematized—*i.e.* which cannot be conveyed from mind to mind in books, in systematic treatises—I had almost said, which cannot be given clinically, because the necessary grouping of like cases rarely accompanies clinical opportunities; secondly, on a natural anticipation of the progressive steps which might be foreseen in a scientific art cultivated with such intelligence, such laborious activity, and such an abundant supply of husbandmen as the present century has produced; and thirdly, on the opinion that among those who had been actively engaged for a long period in extensive hospital practice would be found a fitting exponent of surgical progress.

This, gentlemen, is the conception I have adopted of the original intention of this College in instituting the short course of Lectures on Anatomy and Surgery which I have undertaken to deliver. How far I must fall

short of responding to that intention I need not to be reminded. But I feel convinced that the attainment of even mediocrity is best secured by planting a high standard before the mind, with the determination of approaching as near to it as one has strength to do. Nor need I seriously appeal to your indulgence for the manner of expressing my views. I am sure that many of my listeners will readily appreciate the *facilis descensus* by which an habitual lecturer to students, whom he *can* presume to instruct, may be betrayed into treating an audience, whose high reputation and whose professional knowledge far exceed his own, as if he presumed to instruct them also. Nor is it necessary that I crave your consideration for my embarrassment in the selection of words and phrases appropriate to the ideas which I intend to convey.

> "Nam neque chorda sonum reddit, quem vult, manus, et mens,
> Poscentique gravem persæpe remittit acutum;
> Nec semper feriet quodcunque minabitur arcus."

But, gentlemen, phraseology and diction have been to me minor considerations in comparison with the anxiety of choosing a subject which would be fitting for hearers so distinguished in their profession. From time to time, you have listened with admiration to my predecessors in this chair, as they expounded to you the more recent advances in the pathology and diagnosis of the most important surgical diseases. Histology, general anatomy, and physiology have been so perfectly elaborated here as to bring under your attention their most recent discoveries; and it appeared to me that my forerunners had left to me, for the present, but one unoccupied department—namely, that of Therapeutics. By Therapeutics, however, I do not mean to imply the action of drugs, which more especially belongs to the department of the physician; but rather the influence of what I may venture to call "Natural Therapeutics" in the cure of surgical diseases. The chief of these is one so apparently simple as to make me almost apologize to you for selecting it. It is Rest—Physiological as well as Mechanical Rest—which I hope to prove in the course of these lectures to be so important as to demand the very serious attention of every practical surgeon.

Regarding this subject of Rest in its highest, closest, and best relation to mankind, and looking at it by the aid of my feeble penetration, I would, in all humility, remind you that when God ordained that man should live by "the sweat of his face," as a punishment for his disobedience, it pleased Him, in the plenitude of His unspeakable benevolence, to permit man's fatigue and temporary exhaustion to be followed by his greatest earthly solace,—the blessing of rest and repose, by calm and peaceful sleep; a blessing which should be the immediate reward of his labor. Nature devoting her best efforts, during this period of rest and sleep, to repair those powers which may have suffered exhaustion, to renovate the bodily strength, and to restore the mental vigor, mitigates man's punishment by a source of real and refreshing enjoyment, enabling him to resume his labor in all the delighful vigor of a renewed existence.

Entertaining, as I do, the most exalted admiration of Nature's powers of repair, the thought has not unfrequently occurred to my mind, when watching cases of extensive local injury, "What would have been the condition of man on earth, had it pleased the Creator to withhold from him this power of repairing his injured tissues?"

In my reflections on the subject of rest *as a curative agent*, my mind naturally reverted to that period of man's existence when it was the sole

curative means of which he could avail himself. I could but picture to myself the timorous awe which must have been engendered in his mind by the first accident which happened to him. Let us imagine our first parents suddenly thrust out of the garden of Eden, and doomed to toil for their daily bread; with hands unused to labor, inexperienced in the substitutes for unnecessary exertion and in the avoidance of local injury, and exposed to all the accidents of a precarious existence. Let us try to realize the awe-stricken dismay which must have oppressed man's mind on the infliction of his first wound, his first experience of pain ;—the breach of surface disclosing to his sight his blood flowing unceasingly, or leaping at sustained intervals, from its opened chambers, his sense of fainting, and his ultimately sinking on the earth under the foretaste of death ; this, too, with the recent denunciation, "Thou shalt surely die," still ringing in his ears. Can words depict the hopeless anguish which he must have endured? But what follows? See him awakening to life again, the stream of blood stayed, the chasm plugged, his strength revived, and day by day that wound—which he regarded as the badge of death, the vengeance of the Creator's wrath—narrowing and healing till it could hardly be seen.

I have made these observations for the purpose of showing the original promptings of Nature to man, for the alleviation of what must have necessarily befallen him in his altered condition. Pain was made the prime agent. Under injury, pain suggested the necessity of, and, indeed, compelled him to seek for, rest. Every deviation from this necessary state of rest brought with it, through pain, the admonition that he was straying from the condition essential to his restoration. He must have observed with astonishment the breaking asunder of the newly formed tissue or the steady development into normal structure, which occurred in exact accordance with the disturbance or rest to the parts which the sense of pain had enabled him to regulate so accurately, and to employ so beneficially for his own personal relief and comfort.

That the Lord of all should have implanted in man, beyond the endowments which enable him to sustain his existence under the punishment of labor and the vicissitudes of his daily life, a recuperative power from the accidents and mischances of his precarious existence, appears to me to supply an evidence of His merciful and unspeakable love, too lightly considered.

But I must not lose sight of the immediate object of my lecture. I will, therefore, now proceed to the subjects of growth and repair.

Growth is the antitype of repair, prefiguring the physiological capabilities of existing structures to repair themselves. Without digression, I may say that so intimate is the association between rest and growth as to make them appear, on a superficial view, to stand to each other in the relation of cause and effect. Accurate observation of the animal and vegetable world certainly reveals their perpetual coexistence ; and growth, as a rule, seems to proceed, *pari passu*, with physiological rest.

Mr. Ward* says : "All plants require rest, and obtain it, in some countries, by the rigor of winter ; in others, by the scorching heat of summer. Cultivators often fail in their attempts to grow certain plants from want of attention to this essential point. Thus most Alpine plants, which enjoy an unbroken rest under the snow for several months, are very difficult of culture in our mild and varying winters.

* On the Growth of Plants in Closely-glazed Cases, p. 11.

"The winter of 1850–51 was ushered in by some heavy falls of snow, with which I filled my Alpine case, giving the plants a perfect rest of three or four months, and with a most satisfactory result; the *Primula marginata*, *Linnæa borealis*, and other species, flowering much finer than usual. Many of these beautiful plants would, I am convinced, succeed well, if kept for five or six months in an ice-house.

"Plants, in hot countries, have their periods of rest in the dry season. In Egypt, the blue water-lily obtains rest in a curious way. This plant abounds in several of the canals at Alexandria, which, at certain seasons, become dry; and the beds of these canals, which quickly become burnt as hard as bricks by the action of the sun, are then used as carriage roads. When the water is again admitted, the plant resumes its growth with redoubled vigor."

Our great master in physiology, John Hunter, has not left this field unexplored, for we find, not only in his published works, but in others which remain in manuscript, that the subject of rest occupied no inconsiderable portion of his attention. "Most plants," says he, "have their periods of growth and periods of rest.

"Some plants close their leaves, others their flowers, at particular hours of the day or night; and with such regularity does this period of rest take place, that more than one vegetable physiologist has proposed to construct from them a floral clock."

We all know how eagerly rest is sought for by the lower animals, especially in periods of suffering from injury or disease—how they endeavor to escape from the prying curiosity of man in order that the injury may be the more speedily repaired.

The value of rest in fostering the production of that highly organized animal tissue which forms so large a portion of our staple food is well known to the stock-keeper and grazier. A homely illustration may be found in the fact that in infancy the child who sleeps much mostly thrives. *Mutatis mutandis*, the observation is equally true, that the wakeful, restless child seldom displays the evidence of active nutrition. Doubtless all will admit that in infancy development is in its highest state of activity, and that the healthy infant passes the greater portion of its life in a state of rest and sleep. Growth—the renewal of some parts, and the fresh development of others—seems thus to claim sleep and rest as its helpmates.

Thus far I have endeavored very briefly to point out the relation of rest to growth. I would now say a few words regarding the relation of rest to *repair*.

Repair is but the repetition of growth. The same elements, the same kindred conditions, are necessary to the same results. Rest is the necessary antecedent to the healthy accomplishment of both repair and growth. This surely is the natural suggestion of a means towards an end which should never be lost sight of by the physician or surgeon. For example, children who are ill and lose their rest waste very rapidly, more rapidly in proportion than older people; but as soon as the morbid condition subsides, and rest asserts its power, the recovery or repair becomes extremely active, accompanied by an increased tendency to sleep; sleep supplying the great desideratum previously required.

Take, for example, the case of a child suffering greatly from the irritation of stone in the bladder, which prevents sleep, induces sometimes extreme emaciation, and urges the child even to the verge of death. How marked, how almost immediate is the change on the removal of the stone!

On giving rest to the bladder, and consequent constitutional rest to the general system, the child falls into a profound and prolonged sleep.*

In principle, the same remarks and the same reasons would apply to cases of extreme dyspnœa relieved by the operation of tracheotomy, of strangulated hernia after the reduction by taxis or the knife, or to the removal of an extraneous body from the auditory canal. In these and in many other instances which might be adduced, the relief afforded by the surgeon is often followed in children by long and highly restorative sleep.

The interruption of rest by local disease, occurring to persons in the middle period of life, does not cause the same degree of exhaustion and wasting as in the young. They bear the loss of sleep better, because their constitution has to sustain the stress of repair only—not of both development and repair, as in the child. Their recovery is slower; their subsequent sleep is not so profound nor so prolonged, nor their rest so complete. The defective sleep and slow repair which manifest themselves in the old after injury of any kind are familiar to us all.

What I have here endeavored to inculcate is, that growth and repair bear an exact relation to due physiological rest, local and general.

Although it is, I believe, impossible to explain what are the delicate elaborations which are associated with repair and growth (those marvellous renewals of life and strength resulting from repose and rest), I need not insist upon their obviously beneficial and constant ministration to the exigencies, emergencies, and necessities of man's life on earth. Practically, the maximum of result is co-equal with the minimum of disturbance. Thus rest becomes the great fosterer of repair.

Let me employ a familiar example to illustrate the effect on the brain of rest, by referring to any overworked member of our own profession at the end of the London season. Free from structural disease, but worn, and appearing prematurely old from exhaustion by mental labor, not physical exertion, he takes his holiday. His rest from professional duties consists in riding, walking, fishing, or shooting. It is physical exertion and corporeal work which he selects for his relaxation; but during the same period he carefully excludes all mental worry. Now, I apprehend that under these circumstances some parts of his brain are nearly at rest; others are occupied with their appropriate function of superintending and regulating muscular exertion. He is, in fact, calling into activity the latent or suspended function of the cerebral centres, leaving the higher, the intellectual part of the brain, to work out its own recovery from overfatigue or exhaustion by rest—that is, by freedom from its own peculiar function or occupation. After a time he returns completely invigorated, improved in general appearance, active, and full of mental vigor, and equal to the resumption of almost any amount of renewed professional exertion, without fatigue to his brain.

I may adduce this additional remark regarding the beneficial influence of rest, that those persons who drop off to sleep quickly, anyhow or anywhere, and sleep soundly, undisturbed by active dreaming, are, *cæteris paribus*, capable of sustaining a greater amount of mental and corporeal exertion than those who find it difficult "to get off to sleep"—who sleep lightly, and, dreaming much, awake but little refreshed.

* For some interesting information (gathered chiefly at the Children's Hospital) on the risks of operations in childhood, and more particularly, as bearing upon the present point, for an account of two cases of lithotomy in very exhausted children, the reader should refer to the first note which Mr. Howard Marsh has appended to the Clin. Lect. and Essays by Sir J. Paget, of which he is the editor.—[Ed.]

elasticity. These forces, aided by the contractile power of the blood-vessels themselves, bring the liver back to and maintain it in its condition of rest; thus allowing the individual minute secreting parts to recover their physiological strength and their tone.

Again, the liver is so placed as to have the additional advantage of pressure from without, by its subjection to the contractile power of the muscular walls of the abdominal parietes and the diaphragm, especially during exercise and active respiration. This no doubt explains the benefit of walking exercise, in cases of congested or torpid liver, at which time the liver is compressed between the diaphragm and the respiratory part or upper half of the abdominal parietes. I would here ask you to observe the effect of *forced rest*, or the absence of this pressure upon the liver, in cases of accident which necessitate the recumbent position, and induce congestion of the liver and jaundice. For example: we see a patient in good health suddenly placed upon his back by the fracture of a leg, the local injury being confined entirely to the leg. The fracture goes on well, but the patient in a few days is jaundiced, without much constitutional disturbance. A moderate diet and a few doses of blue-pill with saline purgatives soon dispose of the jaundice, and thenceforward everything proceeds healthily. I believe the congested liver, which leads to the jaundice, results from the forced rest to which the liver is subjected by the recumbent position; the circulation through the organ up to the period of the accident having been aided by active respiration and ordinary exercise. The withdrawal of these aids leads to congestion of the liver, and thence to jaundice. The same kind of congestion of the lungs at their bases and posterior obtuse margins may, and frequently does, take place under the influence of difficult and inefficient respiration, dependent upon the difficulty of moving the posterior parietes of the chest while the patient is in the horizontal posture. The circulation through those parts of the lungs is not completed; and as the quantity of blood circulating, up to the period of the accident, was adapted to a free and complete respiration, this want of balance between the area of respiration and the quantity of blood circulating, causes pulmonary congestion and pneumonia. We see this fact exemplified when the patient is compelled to lie on one side, which, by interfering with the mobility of the thoracic parietes of that side, causes congestive pneumonia on that side only. I have repeatedly observed this one-sided pneumonia disclosed at the post-mortem table, associated with lateral posture of the patient during life. The duty of the surgeon is to reduce the quantity of the circulating fluid by purgatives and diaphoretics, if practicable, and to allow the patient to sit, so that the chest may be as little as possible encumbered by position. No doubt it was the fatal effects upon the lungs and liver, which local and remote accidents seemed to produce, which induced our forefathers to "let blood" in almost every kind of accident which compelled the patient to keep quiet, or confined him to bed.

The spleen has a strong elastic capsule, and also an internal network of highly elastic* tissue, so that the interior of the organ may, when

* In addition to the elastic fibres spoken of above, the presence of involuntary muscular fibres in the capsule of this organ, which, from its close relation to the digestive function, is constantly liable to considerable variations in size, shows an especial provision for providing the spleen with rest. The existence of these fibres, though disputed in man (W. Müller and Harless affirming, while others, as Gray and Kolliker, deny or doubt their presence), has been demonstrated in the capsule and trabeculæ of the spleen of many of the mammalia, notably the ruminants and the pig. Their

necessary, be compressed, and its gorged condition reduced to comparative emptiness.

The kidneys also possess a strong elastic capsule for the same purpose, and are also subjected to pressure by the weight of the superimposed colon.

The tunica albuginea, which surrounds the testicle, tends in like manner to empty that organ, and to give it rest.

The lungs are extremely elastic; this elastic property aiding, without muscular force, the return of the lung to a state of rest or quietude after full inspirations which fill the lungs with air. I may here remark, that it is proved by the preparations before me, that the lungs have a very definite form, which adapts them, in their extremest healthy distention, to the surrounding structures, without encroaching upon any of them. Thus we find the lung especially grooved or hollowed out, to allow the cavæ, descending aorta, arteria innominata, and left subclavian artery to pursue their courses without hindrance. The following is the plan I adopted successfully, more than twenty years ago, for the purpose of injecting the human lungs so as to display the exact configuration of their surfaces:—

Remove the lungs and trachea carefully from the body without any laceration of their structures. Suspend the lungs in a pail or small tub (large enough to allow of their full expansion) containing water sufficiently hot to maintain melted tallow in a fluid state. Introduce a large tube into the trachea, and pour warm fluid tallow slowly through the tube until the lungs appear full; then leave them for a short time submerged in the water, hot enough to keep the tallow within the lungs in a state of fluidity. The air in the cells of the lungs will gradually rise and find its way out through the tube in the trachea, thus making space for the introduction of more melted tallow. This method of proceeding must be repeated at intervals in the same slow and gentle manner until the whole interior of the lungs and trachea is filled with fluid tallow. The lungs are then to be immersed in tepid, and subsequently in cold, water, until the tallow becomes quite firm. Preparations made in this manner can be preserved for many years.

One of the largest and the most remarkable excavations noticeable on the right lung is found at the base of the middle lobe. This excavation corresponds with, or receives, the right side of the right auricle of the heart; but for this the right auricle, when distended with blood, as it frequently is, would be pressed upon by the base of the wedge-shaped mass of lung which is termed the third lobe. Another advantage of this arrangement is, that the right auricle, thus distended, exerts its mechanical influence upon a small portion of lung, which yields, and permits its distention. It is probable that this fact constitutes one of the reasons for the existence of a third lobe in the right lung; and it is worthy of this additional remark, that this third lobe is wedge-shaped, a mechanical form seldom employed in the construction of the human body. This wedge-force is the most powerful mechanical force which can be employed; and, being interposed between the upper and lower lobe, is competent to separate them from each other, and from the middle mediastinum containing the heart, &c. The preparation which I now present to you demonstrates the anatomical relation of the right auricle and the base of the middle lobe of the right lung which I have just described.

abundance in the spleen of these animals, may, I think, be explained by the frequent and sudden interruptions to which the digestive function must of necessity, from their mode of life, be subject in these animals.—[Ed.]

Quitting this digression regarding the surface anatomy of the lungs, I would observe, that if the views which I have advanced in relation to Nature's expedients to procure mechanical rest be true in their anatomy and sound in their physiology, as applied to the thoracic and abdominal viscera, they must also be true of the brain. This suggests the intention of the interstices between the convolutions and other sinuosities and spaces on the surface of the cerebrum, and assigns a probable reason for the existence and position of the ventricles of the brain.

One of the purposes of the lateral ventricles is to allow room for the accumulation of venous blood in the plexus choroides during a state of general cerebral congestion, as in sustained inspiration. The cerebro-spinal fluid within the ventricle supports the blood-vessels, and so prevents their rupture. Mr. Quekett tells me that any attempt to inject the plexus choroides, except in a liquid medium, is sure to cause rupture of the blood-vessels.

In order to point out the parallelism, in this respect, between the mechanical appliances made use of in the cerebral circulation, and the like influence in the capsular organs within the chest and abdomen, let us consider the relation of some of the deep, enclosed, and internal parts of the brain.

For instance, the corpus striatum and thalamus opticus are placed within the cerebrum, and project into the lateral ventricles. These parts superintend the movement and sensibility of the upper and lower extremities.

The completed brain, being enclosed within a solid case with unyield-

These sketches, copied from drawings made from nature, are introduced for the purpose of showing the position in the human brain of the cerebro-spinal opening, through which the cerebro-spinal fluid passes to and from the interior of the brain. The size and outline of the cerebro-spinal opening vary in different brains.



Fig. 1.



Fig. 2.

a, Posterior and inferior part of the cerebellum overlying the medulla oblongata.
b, Upper and posterior part of the medulla oblongata.
c, Cerebro-spinal opening for the transmission of the cerebro-spinal fluid.

ing walls, admits of no possibility of eccentric enlargement. If parts or organs liable to sudden or prolonged calls upon their function were placed within and surrounded by solid brain, they could not enlarge, except by pressure or encroachment upon some other parts, without creating mischief; they could not, in fact, be obedient to that general principle in physiology which I have mentioned.

This increase in dimension of the parts forming the floor of the lateral ventricles is permitted, however, towards the interior of the ventricles, by the cerebro-spinal fluid receding through the foramina of Monro, third ventricle, aqueduct of Sylvius, and fourth ventricle, and thence through the cerebro-spinal opening in the lower part of the fourth ventricle to the base of the brain or sub-cerebral spaces, and so into the vertebral canal. As the local hyperæmia of the blood-vessels in the thalamus, corpus striatum, &c., subsides, the cerebro-spinal fluid rises into the ventricles, and makes a properly-adapted pressure upon the corpus striatum and thalamus, reducing them to their size of inactivity, and sustaining them in a state of rest; the cerebro-spinal fluid in this respect serving the analogous purpose of the elastic capsule of the liver, kidney, and spleen.

LECTURE II.

Distribution of the Dura Mater—External and Internal Arachnoid in the Cranium and Vertebral Canal—Physiology of the Cerebro-Spinal Fluid—Relation of Spina Bifida to the Cerebro-Spinal Fluid — Danger of Drawing off all the Fluid — Clot of Blood Giving a Cast of the Third and Fourth Ventricles and Intervening Spaces—Case of Occlusion of the Cerebro-Spinal Opening Accompanying Internal Hydrocephalus.

In my last lecture I endeavored to illustrate the mechanical means employed by Nature to reduce organs after they have been in a state of physiological excitement or turgescence, while performing their appropriate functions, to the proportions natural to their state of rest. The examples to which I particularly referred were selected from the liver, the spleen, the testicle, and other organs; and I was on the point of showing that if this principle were true in anatomy and sound in physiology as applied to these organs, it must of necessity be true as regards the brain itself. I purpose in this lecture to place before you the facts which seem to sustain that opinion. I shall endeavor to prove that the cerebro-spinal fluid performs, in relation to the circulation of the brain, the same functions that the elastic capsules referred to perform in regard to their viscera. The diagram before you is a median section of the bones of the head and of the vertebral canal. Within them we find placed the brain, the spinal marrow, and the membranes which are described as investing the spinal marrow. I shall be compelled to detain you with some anatomical details with which you are familiar, but my so doing constitutes a necessary step in my attempt to show how this action of the cerebro-spinal fluid is produced.

The letter *a* indicates the dura mater, which, you will observe, lines the whole interior of the cranium, and, after forming the tentorium, pursues its course down to the lower part of the vertebral canal, terminating in a conical point nearly opposite the second bone of the sacrum. A considerable space exists between the vertebræ and the dura mater, so that this interval allows expansion or eccentrical dilatation. I must direct your attention to certain lines (letter *h*) which are introduced for the purpose of localizing a piece of anatomy which, I think, has not hitherto received its proper attention. These lines represent natural ligaments, which proceed from the anterior inferior part of the dura mater, become fixed to the bodies of the sacrum seriatum, and pass downwards nearly as far as the first bone of the coccyx. So much for the dura mater. You will notice that the letter *b* is intended to point to the external arachnoid, composed of two layers. If we trace the black intermediate space upwards from the vertebral canal into the interior of the skull, we find that it corresponds to the space between the interior of the cranial portion of the dura mater and the surface of the cerebrum. Now, the external arachnoid, which is a complete serous membrane in itself, is formed of two layers: one layer lines the internal portion of the dura mater, and gives it its smooth character, and in the cranium the other rests upon the pia mater of the brain.

Let us now trace the continuity of this external arachnoid downwards

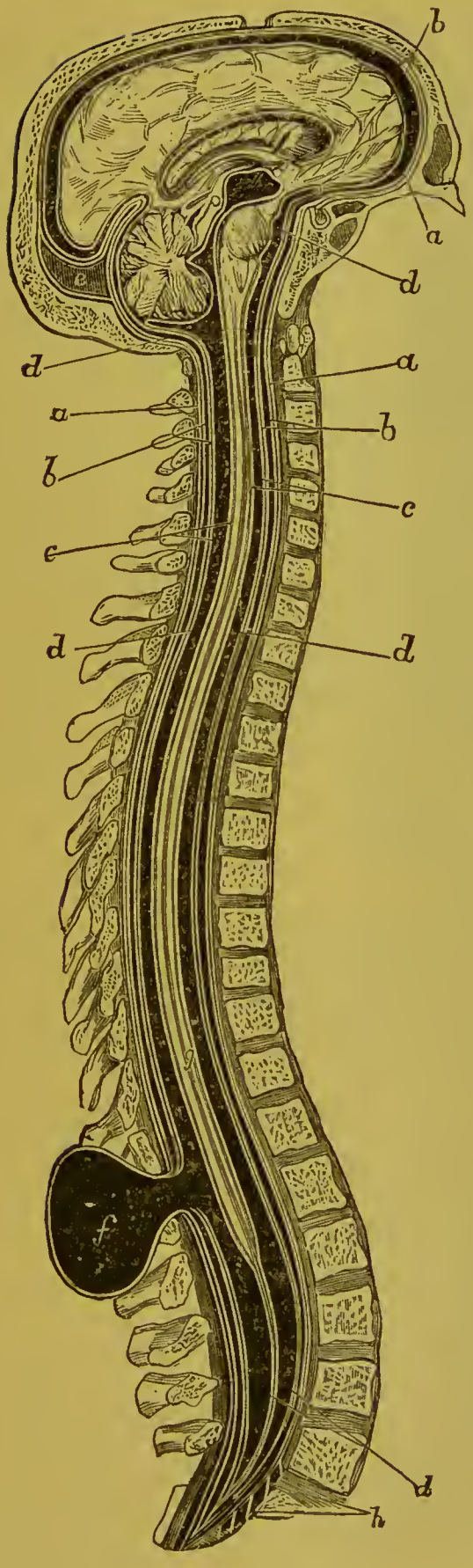


FIG. 3.

a, Dura mater. *b*, External arachnoid. *c*, Internal arachnoid. *d*, Space occupied by cerebro-spinal fluid. *e*, Torcular Herophili. *f*, Spina bifida tumor. *g*, Spinal marrow closely invested by pia mater. *h*. Separate ligaments fixing the anterior parts of dura mater to the second, third, fourth, and fifth portions of sacrum. (There are other deliciate ligaments passing separately from the posterior part of the dura mater to the arches of the sacrum and lumbar vertebræ, not shown in this sketch. The considerable space which exists naturally between the dura mater and the vertebræ, occupied by the rachidian veins and areolar tissue is also omitted.) *i*, In the transverse section, indicates the position of the spinal nerves entering their dura-matral sheath. The posterior half of the dura mater is accurately represented as much thicker than the anterior half; its structure is more dense and more elastic.

into the vertebral canal. Here you may notice its linear continuity lining the internal portion of the dura mater, and proceeding downwards to the lower part of the dura mater, which contains the spinal marrow. This external arachnoid is here again seen to be composed of two layers: its external layer, which lines the internal portion of the dura mater; and the internal layer, which is blended with the external layer of what I should denominate the internal arachnoid, to which I will presently direct your attention. This external arachnoid in a normal state contains only a very small quantity of serous or albuminous fluid; and I suppose the function of this external arachnoid is simply to pour out a small quantity of fluid intended to lubricate the two surfaces of the external arachnoid during the movements of the brain. The ill effects of any undue friction are prevented by the small quantity of fluid which exists between the surfaces of the external arachnoid. The letter *c* points to what I should denominate the internal arachnoid. It is this internal arachnoid which contains the cerebro-spinal fluid, which proceeds to the *interior* of the brain through the cerebro-spinal opening, and then lines all the ventricles of the brain, and their different intermediate passages — with the exception of the fifth ventricle.

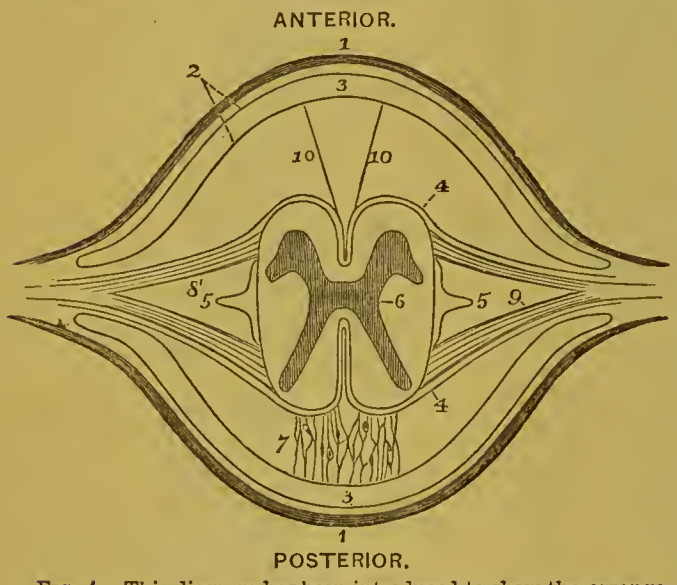


FIG. 4.—This diagram has been introduced to show the arrangement of the different membranes and spaces as they are believed to exist in the spinal column.

1, 1, Dura mater passing down to end on the sheath of the nerves.

2, 2, Layers of arachnoid forming, 3, cavity of arachnoid.

4, 4, Pia mater ending on nerve-sheath.

5, 5, Ligamentum denticulatum.

6, Gray matter of spinal cord.

7, Delicate areolar tissue found in the sub-arachnoid space between the arachnoid and pia mater.

8, Anterior and smaller, 9, posterior and larger, roots of spinal nerve.

10, 10, Similar tissue to 7.

The existence of this cerebro-spinal aperture underneath the cerebellum, and between the cerebellum and the medulla oblongata, is not perhaps universally admitted; but I believe, beyond all doubt, that it is the normal arrangement of structure, that there should be such an aperture. Some years ago I took a great deal of trouble for the purpose of ascertaining this point in a very exact manner; and in no one instance, except where there were abnormal collections of fluid in the interior of the brain, did I find this aperture wanting. In other words, in every brain which I examined, except in cases of disease (Figs. 8 and 9), I found there was such an aperture, freely allowing fluid to pass inwards and outwards from the interior of the brain. I shall hereafter have the opportunity of laying before you some cases in which this aperture was closed, producing, in fact, internal hydrocephalus.

This diagram (Fig. 3) does not pretend to explain the exact and minute distribution of the internal arachnoid membrane, but only the general arrangement which exists at the base of the brain. If we trace the outer layer of the internal arachnoid upwards and forwards, as far as nearly opposite to the fissure of Sylvius, it there becomes reflected upon

itself, and lines the under surface of the brain, crura cerebri, pons Varolii, medulla oblongata, &c. Tracing this membrane (the internal arachnoid) posteriorly, its posterior layer passes underneath the cerebellum, joined to the internal layer of the external arachnoid; it then quits the external arachnoid, and follows the under surface of the cerebellum until it reaches the cerebro-spinal opening, which it enters. You notice, therefore, that this large space (*d*), which I now term the internal arachnoid cavity, and which contains the cerebro-spinal fluid, not only passes down the whole length of the vertebral canal (the relative position is indicated in this diagram), but the fluid lies under and supports the cerebellum, as well as the most important parts of the base of the brain; and it further passes upwards into the interior of the brain, and is the fluid which we generally find, after death, occupying more or less the various ventricles of the brain. In fact, the central parts of the base of the brain, instead of resting upon the bones of the skull at its base, rest upon this collection of cerebro-spinal fluid, which forms for it a most beautiful, efficient, and perfectly adapted water-bed; the water-bed itself being sustained in its position by the force of the venous circulation—as I will prove to you presently—and also by the elasticity of the dura mater in the vertebral canal.*

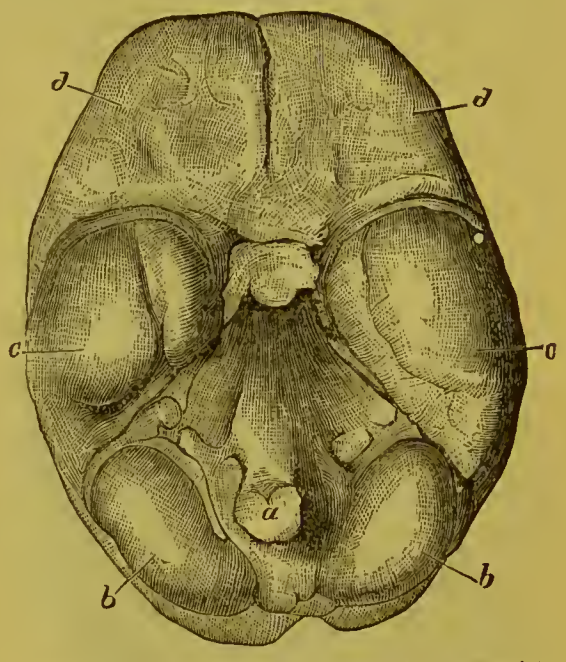


FIG. 5.—*a*, Cut extremity of medulla. Immediately in front of this is the large space occupied by cerebro-spinal fluid. *b b*, Under surface of cerebellum. *c c*, Middle lobes. *d d*, Anterior lobes.

For the purpose of pointing out the practical application of these anatomical facts regarding the function of the cerebro-spinal fluid in its relation to the base of the brain, I might say that almost the only part of the

* This passage has been left as it was originally written by Mr Hilton. The reader will see at once that the space between the two layers of the "external arachnoid" corresponds to the cavity of the arachnoid, and that the interval between the two layers of the "internal arachnoid" is the sub-arachnoid space between the arachnoid and the pia mater. Mr. Hilton believes that the cerebro-spinal fluid is contained between two epithelial surfaces, *i.e.*, that one such surface not only exists, as usually described, upon the arachnoid, but also upon the pia mater as well, and that thus the otherwise inevitable infiltration of the pia mater is prevented. With all due deference to Mr. Hilton, I cannot quite accept this view. In the first place, as far as I am able to make out microscopically and with the use of such reagents as silver nitrate, no layer of epithelial cells exists upon the pia mater. I am further inclined to believe that a slight infiltration of the superficial part of the pia mater does take place, as the cerebro-spinal fluid passes backwards and forwards over its surface. More than very slight infiltration is prevented, partly by the fact that the cerebro-spinal fluid is broken up into a number of little lakes and pools by the very delicate bands which are found in the sub-arachnoid space (the tissue forming these bands being also infiltrated by the fluid), and partly by the deeper layers being most closely united to the brain substance by the innumerable vessels entering it.

I am indebted to Mr Davies-Colley for the knowledge of the fact that Henle applies to the sub-arachnoid tissue the epithet "wassersüchtig," œdematous.—[ED.]

base of the brain which fits in close coaptation with the bones of the skull is the inferior part of the anterior lobe of the cerebrum, where it rests upon the orbital plates of the frontal bones. So accurate is this coaptation, that if you were to make a cast of the interior of this portion of the skull, and compare the model from it with the under surface of that part of the brain which naturally occupies this position, you would find them in exact correspondence. This is not the case with the other portions of the base of the brain. If you examine these two models * which I have placed before you, you will find that one of them is an exact outline and configuration of the various parts which form the base of the brain; the other model is simply a wax cast of the interior of the same skull, deprived of the brain. Now, if the base of the brain rested upon the base of the skull, the wax model which is taken from the interior of the skull ought to give a cast exactly corresponding to the base of the brain. But we see that this is not so, and the great difference marks the extent of the interval occupied by the cerebro-spinal fluid. We have here a complete demonstration that there is not a coaptation or exact fitting between the under surface, or base of the brain, and those bones which form the base of the skull. This sustains the opinion that the two middle thirds of the base of the brain do not rest upon the bones, indeed do not touch the bones at all, but rest upon this collection of cerebro-spinal fluid, which I have ventured to call the perfect water-bed of the brain. Hence a person may fracture the base of the skull, and yet show no evidence of injury to the brain itself; a fact which every observing surgeon knows to be true. I well remember a man walking into Guy's Hospital, sitting upon his bedside, undressing himself, and lying down composedly in his bed: this patient, on his admission, had bleeding from both his ears, and subsequently died from the injury to his head, it being shown at the post-mortem examination that he had a very severe fracture of the base of the skull. Yet this man walked into the hospital, and showed no manifestation of loss of power or sensation in his legs, and no evidence of any encroachment upon those parts of the brain which form its base.

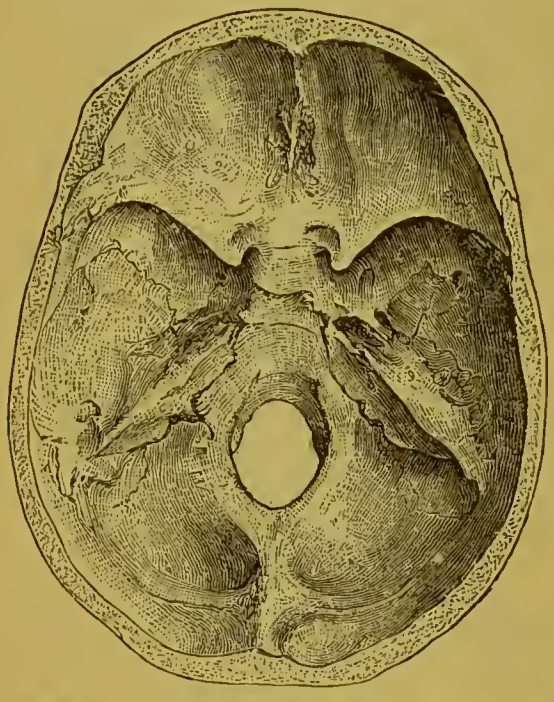


Fig. 6.—Drawing of base of skull, introduced to show the want of correspondence between certain parts of the base of the skull and of the brain.

Some time since I was requested to see a gentleman in the country, who, coming home from hunting, was thrown from his horse, and got his foot entangled in the stirrup. In his fall he struck the back part of his head. After a time his horse was stopped; he disentangled his foot from the stirrup, and expressing himself somewhat confused, mounted his

* The two models here referred to are in the museum of Guy's Hospital. One of them, showing the base of the brain, is represented in Fig. 5.—[Ed.]

horse again, and rode several miles home. This gentleman occupied himself as usual during thirteen days, occasionally riding, sometimes walking, but more frequently driving about the country in the pursuit of his business, and attending one of the county markets. He then became the patient of the surgeon who requested me to see him. At the time I saw him he was suffering from some indications of paralysis dependent on injury at the base of the skull, or high up in the cervical region. This patient subsequently died, and upon examining his skull it was found that he had been the subject of a fracture of its base; yet he pursued his ordinary avocations for thirteen days without the slightest evidence of any cerebral or brain lesion, complaining only of headache and some febrile condition. Now this fracture traversed that portion of the skull where the cerebro-spinal fluid is interposed between the bones of the skull and the brain structure. This is a good illustration, demonstrating that the brain is not actually in contact with the bones at that particular spot. And it shows us also that a man may have a fracture at the base of the skull without, at that time, manifesting any evidence of serious lesion. Supposing a patient to receive a severe blow at the back of the skull: which part of the brain is most likely to suffer local lesion? Certainly not that part of the brain which lies immediately under the point which was struck; but experience points distinctly to the anterior inferior part of the brain as most prone to local injury. In the anatomical fact to which I just now alluded, we shall see the explanation of that circumstance. This is the part of the brain which rests accurately upon, and in complete surface coaptation with, the bones of the skull. When the blow is received at the posterior part of the skull, the whole mass of the brain being driven forwards from the momentum given to it by the blow upon the bones of the skull, the under surface of the anterior part of the brain rubs over the depressed and elevated surfaces which constitute the anatomical features of the anterior fossa of the internal base of the skull. I have seen a case where the blow which led to the fatal injury was received at the back of the skull; no injury was inflicted upon the subjacent part of the brain, the whole effect was propagated to its anterior part—that part which fits accurately upon the bones of the skull—here the under and anterior part of the brain was very much lacerated. These circumstances taken together will show, I think, the practical advantage of distinguishing the parts of the brain which fit accurately upon the skull from those parts which are separated from it by the interposition of the cerebro-spinal fluid.

The cerebro-spinal fluid has a specific gravity of about 1007. It contains scarcely any albumen, and is, therefore, very different from the serum of the blood. The function of this cerebro-spinal fluid is chiefly mechanical—that is, first to protect the more important parts of the brain from vibratory communications from the bones of the skull which might otherwise reach them;* the brain, therefore, at its base does not rest upon the bones, but upon the fluid; secondly, this fluid isolates the various nerves passing near each other towards the same foramina; and, lastly, supported by the cerebral circulation, it tends to bring back the internal organs of the brain to a state of comparative emptiness or quies-

* Mr. Hilton has shown elsewhere (Lectures on the Cranium) that many of the ridges on the inner surface of the base of the skull serve to conduct vibrations to the clinoid processes which lie surrounded by cerebro-spinal fluid, and that the vibrations arrested and lost in this fluid are thus prevented from damaging the base of the brain.—[Ed.]

cence after their state of activity. In this latter respect the cerebro-spinal fluid may be said to perform for the parts in the interior of the brain a function analogous to that capsular apparatus to which I have already referred as investing some of the thoracic and abdominal viscera.

I will now elucidate the office of this cerebro-spinal fluid as a mechanical support to the internal parts of the brain, when they have ceased to be in the condition of physiological excitement or turgescence. I have already said that the thalamus nervi optici and the corpus striatum, which occupy the base of the lateral ventricles, superintend the movements and sensibility of the upper and lower extremities. I presume that when these functions are actively employed, these two parts especially are in a state of turgescence, and that if they were imbedded in the solid brain it would be impossible for them to enlarge without encroaching upon some of the adjoining structures, and thus inflicting, at any rate, temporary injury. But the corpus striatum and thalamus nervi optici have a large extent of surface, which projects towards the interior of the lateral ventricles, and in proportion as they become enlarged by congestion they displace the cerebro-spinal fluid through the foramina of Monro, through the third ventricle, iter a tertio ad quartum ventriculum, into the fourth ventricle, and thence through the cerebro-spinal opening, and thus provision is made for the hyperæmia of the thalamus and corpus striatum. When the physiological excitation ceases in the corpus striatum and thalamus nervi optici, then the cerebro-spinal fluid, supported by the venous circulation of the brain and the elasticity of the dura mater in the vertebral canal, rises up again through the same channels, and thus gives a mechanical support to the thalamus and corpus striatum in their state of repose. It is worthy of notice that these collections of fluid in what we term "the ventricles of the brain" communicate with each other through the medium of very narrow passages; and I must not omit to call your attention to the point, that wherever these passages are narrowed, the brain structure itself, or some structure added to that particular part, makes these narrowed parts very dense and strong for the purpose of resistance. At the margins of the foramina of Monro the structure of the brain is very dense, and the whole length of the iter a tertio ad quartum ventriculum is surrounded by a comparatively very dense material. I suppose the reason for the existence of these narrowed openings is for the purpose of preventing a very sudden and rapid enlargement of the internal parts of the brain, in order that their turgescence may be slowly and steadily brought about. In fact, as the turgescence slowly and steadily increases, the cerebro-spinal fluid recedes in an equal degree through these various ventricles and contracted passages.

I must now place before you a few facts which show the exact relation between the venous circulation and the cerebro-spinal fluid, in order to prove that they equipoise each other. At an ordinary post-mortem examination, with the body lying upon its back, place a ligature tightly round the neck, so as to compress the jugular veins and prevent the venous blood running out of them. Then remove the thoracic and abdominal viscera, and divide transversely and neatly the various veins which escape from the vertebral canal, through the intervertebral foramina, and lie upon the sides of the bodies of the vertebræ, taking care to leave these veins full of blood. Then take away the bodies of the third and fourth lumbar vertebræ, so as to expose the vertebral canal, with the dura mater, containing the spinal marrow, arachnoid membranes, and the cerebro-spinal fluid. With a body so prepared, if the blood within the

veins of the neck be pressed upwards through the internal jugulars towards the interior of the head, it will be seen that, just in proportion as you press the venous blood in that direction, so you will observe the dura mater rise into the place from which you have removed the lumbar vertebræ ; thus showing that as you push the venous blood into the interior of the unyielding cranium, you displace the cerebro-spinal fluid; the evidence of that displacement being this, that you see the dura mater lifted up by the fluid at the part where you have removed the two lumbar vertebræ. So again, confining your attention to those veins which are in section on the side of the spine, and filled with blood coming from veins in the interior of the vertebral canal—if you place your fingers upon the dura mater exposed by the removal of the bodies of the vertebræ, and make pressure upon it so as to displace the cerebro-spinal fluid, you will observe that just in proportion as you displace the cerebro-spinal fluid will the blood rise within and then overflow the various divided veins to which I have alluded; thus showing that as you make pressure upon the cerebro-spinal fluid you displace blood from the veins which occupy the vertebral canal.

And here let me introduce an experiment bearing upon this subject, made upon a living body. I would not, however, advise a repetition of the experiment, because, probably, it involves a slight degree of risk to the patient. Some years ago I had in Guy's Hospital a patient suffering from fracture of the base of the skull, and from one of his ears a thin watery fluid was pretty constantly running. It occurred to me that if I could make this patient's head more full of venous blood, I might succeed in displacing the cerebro-spinal fluid, and that, if the fracture had established an easy communication between the auditory canal and the cerebro-spinal fluid in the interior of the skull, I should be able to force out of the ear some of the cerebro-spinal fluid. I accordingly went to his bedside, and told him to take a very full breath; I then held his nose and lips, and put my fingers so as to compress his jugular veins on each side of his neck. His face became exceedingly congested and discolored, and he commenced struggling to get rid of the pressure of my hands upon his nose and mouth. This had scarcely taken place before a quantity of thin fluid came running out of the auditory canal, and I succeeded in collecting nearly half an ounce of it. The experiment was now completed; I removed my hands from the nose and mouth of the patient, and he quickly recovered his condition of repose. Thus, then, I had succeeded in displacing from the interior of the cranium a quantity of cerebro-spinal fluid (for so it was afterwards proved to be by microscopic and chemical examination) by propelling to the interior of the skull an increased quantity of venous blood.

I think I have now proved a very close relation between the cerebro-spinal fluid and the venous circulation within the cranium and vertebral column, and that, in truth, under ordinary circumstances, this cerebro-spinal fluid is supported by the venous circulation of the brain and vertebral canal. I have also explained to you how this fluid communicates with the interior of the lateral ventricles, and I believe that when the turgescence of these internal parts of the brain (corpus striatum and thalamus) subsides, the cerebro-spinal fluid rises within the ventricles to occupy the space thus left by their subsidence.

It may be a little wide of my proper subject, but while your attention is directed to the relation of this cerebro-spinal fluid to the interior of the brain, I think it may not be altogether out of place to remind you of the

anatomical relation of the disease termed spina bifida to the internal arachnoid. This will enable me to express the fact that the fluid contained in the interior of the cavity of a spina bifida is cerebro-spinal fluid.*

The spina bifida is essentially the projection backwards, through the imperfect vertebral canal, of the membranes of the brain, and the thin fluid which occupies the spina bifida is in truth the cerebro-spinal fluid (see Fig. 3, *f*). Thus the interior of the spina bifida actually communicates with the interior of the brain through the medium of the cerebro-spinal opening between the medulla oblongata and the cerebellum. I have no intention of dwelling on the subject of spina bifida beyond availing myself of the freshness of this illustration for the purpose of pointing out the danger that is associated with operations upon this disease, especially those of injecting it with any irritating fluid. It is obvious that if any irritating fluid be injected into the cavity of the spina bifida, we are injecting a fluid into a cavity extending the whole length of the spine, and communicating directly with the interior of the brain. Hence, although we may wish to limit the influence of the stimulating fluid to the spina bifida, it is impossible to prevent the extension of the mischief towards the interior of the brain. Illustrations of the fatal effects of this method of proceeding I have myself witnessed. Again, in the operation of ligature upon the spina bifida as a means of cure: if the patient dies of inflammation of the membrane of the spinal marrow, that inflammation is manifested almost exclusively in the internal arachnoid, which contains the cerebro-spinal fluid; and if the mischief extends far enough, and the patient lives long enough, this mischief is actually traceable along the continuity of this internal arachnoid to the interior of the brain. I have seen this effect of the ligature several times. I might also point out that the anatomy of this part, as exemplified by the diagram (Fig. 3), suggests the impropriety of at any one time drawing off the whole of the fluid from the spina bifida. Surgeons know very well that it has happened that when the fluid has been drawn off from the spina bifida as long as it would flow, it ceased only by the patient having a fit—a sort of general epileptic fit—and of that fit perhaps the patient has died. That occurrence receives an explanation when we trace a communication between the interior of the brain and skull and the spina bifida, for it is plain that as you draw off the fluid from the spina bifida, so you withdraw the whole of the cerebro-spinal fluid from the interior of the brain, and from the base of the brain. All the veins become congested and distended with blood, the interior parts of the brain encroach and make pressure upon each other, the various nerves at the base of the brain, including the pneumogastric, are compressed, and the patient dies from defective respiration, or from a struggling or epileptic fit. This is the direct effect of the withdrawal of all the fluid, which is sometimes done in the operation upon spina bifida. Now the safest and best method of proceeding, no doubt, is to take away only so much fluid as will relieve the spina bifida of its state of tension ; the patient then runs no immediate risk from the operation. The removal of extreme tension from the walls of the spina

* Though this is the usual arrangement in spina bifida, that the sac communicates with the sub-arachnoid space, and contains cerebro-spinal fluid, there is no doubt that in a small number of cases the communication is with the cavity of the arachnoid. See Prescott Hewett, Med. Gaz., vol. xxxiv., p. 461, and the Surgical Treatment of Children's Diseases, by T. Holmes, p. 79–81.—[Ed.]

bifida enables those walls to recover themselves, and to produce in time good and healthy skin, which forms the best natural defence of this unnatural projection of the membranes backwards through the defective vertebral canal. After this tapping operation, the skin ought to be supported by the local application of a thick layer of collodion and by a bandage.

The diagram (Fig. 7) to which I am now directing your attention is made from a drawing representing a clot of blood which I found in a patient's brain, in the year 1842. You know that sudden deaths used to be most frequently attributed, erroneously no doubt, to apoplexy, but it has rarely occurred to any person to have the opportunity of seeing a case of apoplexy, where the death was so sudden as in the patient from whom this clot of blood was taken. This patient dropped down dead upon the floor of the room of a public-house in which she had been drinking, and I subsequently examined the body, when I found that the cause of the sudden death was the clot of blood, the outline of which is given in the diagram, the clot itself being upon the table. I avail myself of this clot of blood to indicate two circumstances—first, the continuity of the spaces through which the cerebro-spinal fluid recedes during the increasing size of the corpus striatum and the thalamus; and secondly, to show that the pressure which led to this patient's death was made upon the fourth ventricle, which contains the origins of the pneumogastric nerves. Running the eye along the upper part of the clot, from before backwards, we notice a semicircular notch (*e*), which corresponded exactly with the anterior commissure of the cerebrum in the third ventricle. A little further back is a peculiarly configurated depression (*d*), which is the impression of the commissura mollis. And at the anterior and inferior part is a nipple-like projection downwards (*f*), which fitted into the tuber cinereum of the third ventricle. Behind this (*a*) corresponds to the interval between the two optic thalami. The narrow prolongation backwards (*b*) is a cast of the iter a tertio ad quartum ventriculum passing under the corpora quadrigemina; and joined to this is a lozenge-shaped mass (*c*), having a prolongation downwards, which passed through the cerebro-spinal opening and two lateral wing-like expansions, which were adapted to the lateral recesses of the fourth ventricle, where the trunks of the pneumogastric nerves are placed; it is, in truth, a perfect cast of the fourth ventricle. There must therefore have been, in this case, great pressure upon the floor of the fourth ventricle at the origins of the pneumogastric nerves, which superintend the process of respiration. The sudden death was produced by the blood which had been extravasated into the lateral ventricles having pursued the course of the cerebro-spinal fluid, and rested in the fourth ventricle, and there made so much pressure upon the roots of the pneumogastric nerves as to completely paralyze them; and if the process of respiration could not be continued, as it certainly could not

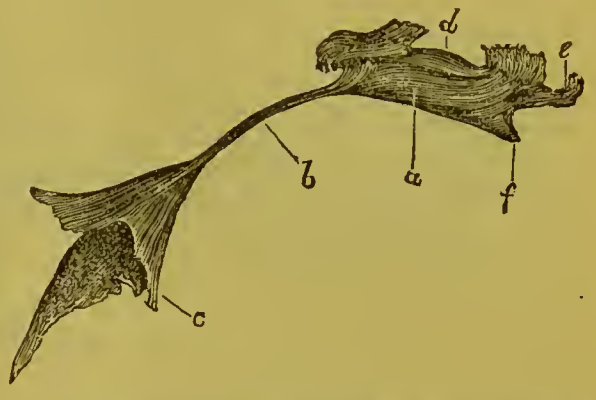


Fig. 7.—Clot of blood occupying and distending the third and fourth ventricles and intervening canal, and is, therefore, a cast of the interior of those spaces.

during the time the pneumogastrics were thus pressed upon by the clot of blood, the patient would necessarily die quickly. This then, I apprehend, is the explanation of the sudden death of the patient. The clot of blood, which was quite entire, will also establish the fact of the continuity of these various parts, through which, as I have undertaken to suggest to you, the cerebro-spinal fluid passes to and fro, according to the state of congestion of the interior of the brain.

I might here remark, that it appears to me impossible that any patient can live with what is called a diffused external hydrocephalus, assuming that the external hydrocephalic fluid is placed within the external arachnoid. As the brain is of a greater specific gravity than the hydrocephalic fluid, it would of necessity sink upon the internal base of the skull, or if it did not sink from its own weight, it would be compelled to do so by the hydrocephalic fluid swimming over the top of the brain, and thus pressing the brain upon the base of the skull. You will remember that the arteries of the brain contain the blood, through the medium of which the brain is nourished and manifests its functions; that those arteries lie between the under surface of the brain and the bones of the skull, and if this hydrocephalic fluid press the brain downwards, it must compress the blood-vessels between itself and the bones of the skull, and in that way the supply of blood to the brain would be cut off. So again, if the base of the brain were thus pressed downwards, the pneumogastric nerves would also be compressed, and the respiration would cease. Now it has never fallen to my lot to see a case of diffused—mark, I say diffused—external hydrocephalus, and, therefore, I presume the cases must be rare. I apprehend that the examples recorded must have resulted from rupture of the internal arachnoid membrane, which allowed the cerebro-spinal fluid to escape from it, and flow over the top of the brain, thus leading to sudden death.



Fig. 8.—Drawing of a specimen of occlusion of the cerebro-spinal opening, taken from a child who died in 1844 from internal hydrocephalus.
a, Cerebellum. *b*, Medulla oblongata, upper and posterior parts. *c*, This letter is placed a little above the cerebro-spinal opening, which is completely closed by dense membranous adhesions.

Before quitting this subject of the cerebro-spinal fluid and the cerebro-spinal aperture, I must call your attention to the drawing, Fig. 8, which represents a specimen of the closure of this cerebro-spinal opening. In such instances the cerebro-spinal fluid could not escape from the interior of the brain; and thus the collection of fluid within the brain would constitute internal hydrocephalus. And here I may add that the drawings from which the diagrams were copied represent specimens of morbid anatomy which I removed from little children who had been the subjects of internal hydrocephalus; and the occlusion of the opening was the only cause of the internal hydrocephalus that I could discover.

The other drawing, Fig. 9, is taken from the same preparation, but represents a longitudinal section of it, which enables us to see the extremely dilated state of the communication between the third

and fourth ventricles, and the point of closure of the cerebro-spinal opening.

These drawings have been in my possession a long time—ever since 1844. At that period of my professional life I was examining the diseases of the brain in children. In almost every case of internal hydrocephalus which I examined after death, I found that this cerebro-spinal aperture was so completely closed that no cerebro-spinal fluid could escape from the interior of the brain; and as the fluid was being constantly secreted, it necessarily accumulated there, and the occlusion formed, to my mind, the essential pathological element of internal hydrocephalus.



Fig. 9.—This engraving represents a *longitudinal* section of the same brain.

a, Cerebellum. *b*, Upper part of the medulla oblongata. *c*, Cerebro-spinal opening, the occluding membrane seen in longitudinal section. *d*, Fourth ventricle, much dilated. *e*, Iter a tertio ad quartum ventriculum, much dilated. Both these cavities and the other ventricles were distended by hydrocephalic fluid.

Internal hydrocephalus is not an unfrequent companion of spina bifida. In many of the cases of that disease that I have examined after death, the cerebro-spinal opening was closed, thus explaining how it happened that although the spina bifida had been tapped during life, and no limit put to the flow of the fluid at the operation, yet the little patient did not suffer from cerebral congestion. Indeed, it was a case of this kind which first made me acquainted with the pathological fact of closure of the cerebro-spinal opening in the fourth ventricle.

I will now detail to you the short particulars of a case of internal hydrocephalus in which the cerebro-spinal canal was closed at the iter a tertio ad quartum ventriculum. This case of internal hydrocephalus I saw in the year 1847, with Mr. Otway, a surgeon at Kensington:—

A. H—— was a child of unhealthy parents, very thin, feeble, and sickly from birth, uttering constantly a peculiarly distressing cry, and having a remarkable rotary movement of the head. When four months old, the head began to enlarge rapidly; and after this had been noticed a week, the infant became comatose, lying perfectly quiet, almost paralytic, with strabismus and dilated pupils; her skin was of a dingy yellow tint; pulse scarcely to be felt; respiration extremely imperfect, both as regards frequency and extent. After the coma had continued twenty-four hours, as death appeared imminent, the anterior fontanelle was punctured by a trocar and canula, and eight ounces of colorless fluid escaped. While the fluid was being drawn off, the infant began to kick vigorously, the eyelids opened, the strabismus ceased, and the pupils contracted. So that the withdrawal of the cerebro-spinal fluid removed the pressure from the third nerve, which had produced strabismus and dilatation of the pupils; it removed the pressure also from the thalamus and corpus striatum: and this freedom from pressure was manifested by the child moving its limbs vigorously. The lips began to move constantly, especially the lower lip, which had been drawn inwards between the gums. When the fin-

ger was introduced into the mouth of the infant, an attempt to suck was made, and a little warm milk and water was swallowed without difficulty. The pulse was about 140, very small and feeble; respiration very irregular; the surface was cold and clammy, but warm applications soon restored its temperature. Moderate pressure was applied to the head. A week after the first operation, after some slight fits, the child became comatose again, and unable to swallow. Eight ounces of turbid fluid were again drawn off, with the same result as before. And three weeks later, the same quantity of fluid, highly coagulable by heat (inflammatory effusion, not cerebro-spinal fluid), was again evacuated under similar circumstances. During the next two months, the child took mercury and chalk, in small doses, with some benefit. The bones of the head were gradually becoming approximated, and the anterior fontanelle was diminished. The child was emaciated, although it took the breast freely. The thumbs were turned in upon the palms of the hands, and the peculiar movement of the lips continued. The child died on the 30th of October, having had convulsions of increasing severity during four days; but it continued to suck, and took notice of surrounding objects, till the day before its death. The child lived nearly three months after the first tapping. I did not see this patient alive, but I suspected, from Mr. Otway's description of the case to myself, that we should find closure of the cerebro-spinal opening.

Post-mortem examination.—Body much emaciated. The bones of the head overlapped each other considerably; the anterior fontanelle was imperfectly felt. There were cellular adhesions between the two layers of the external arachnoid; this membrane was much thickened, and in some places opaque. There was no appearance of cicatrices in the position of the trocar punctures, but some firm adhesions existed at that spot. The veins on the surface of the brain were distended, and a dirty brownish-red discoloration, from altered blood, was noticed between the lobes of the cerebrum. Within the right lateral ventricle three distinct cicatrices were clearly seen, corresponding with the punctures made during life with the trocar. Each lateral ventricle was divided in an exactly similar manner by an opaque structure (resembling its lining membrane), in which there was on each side an aperture of about a quarter of an inch in diameter. This was either a new false membrane developed within the ventricular cavity, or the lining of the roof of the ventricle, thickened and subsequently ruptured, so as to allow the fluid to make its way between it and the ventricular wall; most probably the former of these conjectures is the correct one. The lateral ventricles were distended, and contained four ounces of fluid. The plexus choroides was not to be recognized. The septum lucidum was elongated, its ventricle was enlarged, and contained fluid. The cavity of the tuber cinereum was dilated, and thus compressed the optic commissure, explaining the impairment of vision. The iter a tertio ad quartum ventriculum was dilated nearly as far as the entrance into the fourth ventricle, where it was closed by old and firm adhesion. This occlusion necessarily preserved the fourth ventricle from dilatation, and it was accordingly natural in form. The olfactory nerves, as far as their bulbs, were hollow, and communicated with the anterior cornua of the lateral ventricles—this persistence of a condition normal to about the fourth month of intra-uterine life suggested that the hydrocephalus, with its pathological cause, had commenced during the period of intra-uterine life.

LECTURE III.

Function of the Cerebro-Spinal Fluid in the Fœtal Brain—Case of Occlusion of the Cerebro-spinal Aperture—The Brain after Concussion a Bruised Organ—Comparison between a Bruise of the Brain and that of other Organs—Long Rest Essential after Concussion of the Brain—Neglect of this a Fertile Cause of Permanent Brain Disease—Symptoms of Concussion of the Spinal Cord, and Treatment by Rest—Most of the Graver Operations of Surgery Performed for the Purpose of Allowing Nature Rest to Restore Injured Parts.

A DIFFERENCE of opinion exists among anatomists as to the presence of a well-defined membrane within the lateral and other ventricles of the human brain. I do not wish to express an authoritative opinion, but I will adduce this model of the fœtal brain in support of the fact that there must be a firm and compact membrane lining the interior of the ventricles during the early period of intra-uterine life, when the brain itself is in a semi-liquid or diffluent state. This diagram, Fig. 10, was made from a model of the brain of a fœtus at about the fourth month ; it shows the relative position and size of the lateral ventricles and their walls accurately. The diffluent rudimentary brain-structure is placed between the pia mater externally, and the ependyma containing the cerebro-spinal fluid in the ventricles internally. It appears to me that if a well-defined membranous wall did not exist on each side of the semi-fluid brain-matter, it would be impossible for the brain to grow and to sustain itself in anything like a definite form. The cerebro-spinal fluid contained within the ependyma seems to perform the very important office of supporting the membrane, and thus constitutes a scaffolding or internal arch upon which rests the diffluent brain matter, which is ultimately formed into firm brain-structure.

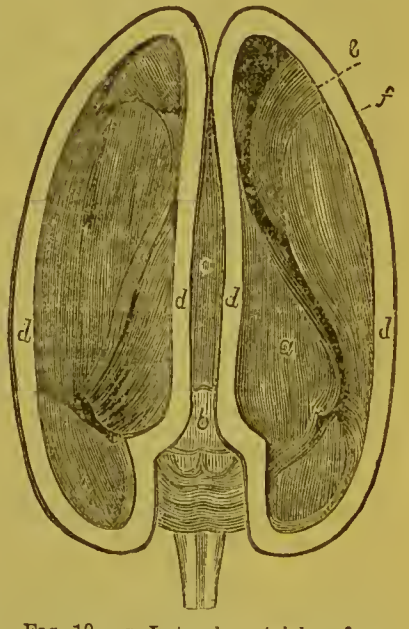


FIG. 10.—*a*, Lateral ventricles of normal size, containing cerebro-spinal fluid. *b*, Corpora quadrigemina, not yet complete. *c*, Corpus callosum. *d*, Semi-liquid brain-structure, lying between the pia mater (*f*) externally and ependyma (*e*) internally.

I will not dwell longer on this subject, but I felt it necessary to advance these facts in confirmation of the belief of the existence of a lining membrane to the ventricles, even at a very early period of fœtal life.

I said previously that I should be prepared to detail another case of occlusion of the cerebro-spinal aperture of considerable interest. I think that the case will be more instructive, and its value better exemplified, if I first read the post-mortem examination, and then allude to the symptoms observed during life.

The gentleman who was the subject of this disease died at the age of

thirty-four. On the day of his death he had visited the Crystal Palace. He had been seized with vomiting in the morning, and again about two hours before he reached home. He walked from the Crystal Palace (a mile or so), and when he entered the house he staggered, and said he felt giddy and oppressed. He was placed on a bed, and cold was applied to his forehead, but he died in a very short time, with stertorous breathing—remaining sensible, however, almost to the last moment. I examined the body, assisted by Dr. Wilks, and this is the report of the post-mortem examination :—

"Cadaveric decomposition was advanced, except within the brain, which presented in this respect a remarkable contrast to the other parts of the body. The convolutions of the cerebrum were large, and their surfaces flattened by pressure from within."

And these convolutions were few, suggesting, perhaps, that the condition of the brain was a persistent state of a very early development of the convolutions ; for although the person was full grown, and thirty-four years of age, the convolutions were large and few.

"The brain-structure was healthy, neither it nor the membranes containing any tubercular deposit. On carefully opening the lateral ventricles, they were found to contain at least four ounces of clear cerebro-spinal fluid."

Regarding the character of this fluid there can be no doubt. It was carefully examined. Its specific gravity was 1008, and it possessed all the microscopic and chemical characters of cerebro-spinal fluid.

"The ventricles were greatly enlarged, and all the receding and projecting angles of the boundaries and cornua were lost or subdued. The foramina of Monro were rounded, and capable of admitting a large quill not quite a third of an inch in diameter. The lining membrane of the ventricle and the choroid plexus were healthy. The septum lucidum and the fornix were softened, but the microscope showed no trace of inflammatory deposit or softening. The fourth ventricle was greatly dilated in all its directions, showing well its lateral cornua which support the pneumogastric, auditory, and other accompanying nerves. The cerebro-spinal opening between the under surface of the cerebellum and the upper surface of the medulla oblongata was completely closed by a tolerably dense membranous structure, which formed a kind of pouch projecting downwards, and showed the direction of the fluid tension upon it to have been from above to below.

"This was clearly seen when looked at either from the ventricular aspect or below from the spinal aspect. The arachnoid in the neighborhood, at the base of the brain, was somewhat opaque and thicker than natural. The large trunks of the cerebral arteries presented a few minute spots of opaque deposit. The veins of Galen and their tributaries were healthy. The heart was healthy, both as regards its muscular tissue and its valves. There was a slight deposit beneath the lining membrane of the aorta. There was no recent disease of the lungs."

The pathological condition of the closure of the cerebro-spinal opening found in this gentleman's brain is well represented by Fig. 8, *c*, but that drawing was made in 1844, from a preparation which I then obtained from the head of a child who had died of internal hydrocephalus.

The details of the history during life present an apparently perfect fitting-in of the symptoms to the pathological anatomy. But I wish it to be understood that this account has not been "cooked," as it is termed. It was not made up for the purpose of agreeing with the facts previously

stated, but was drawn up by the brother of the gentleman himself, who is not a professional man. I asked him to oblige me with a detail of the symptoms which his brother presented during life, and this is his account of them:—

"This gentleman always had delicate health. The nails of his fingers were peculiar in form, the last phalanges being very short, and the nails inserted like two seeds into the cuticle."*

I stop at this point to remark that here apparently we have evidence of a congenital error in the development of the ends of the fingers; and this inclines me to the conclusion that probably the cerebral error, the occlusion of the cerebro-spinal aperture, was also congenital.

"As a child, he was active and wiry, but very irascible in temper. As a man, he was very spare and delicate looking. [All indications of a something which impeded healthy development.] He had always some color in his cheeks, which he retained until a year of his death. He had a fondness for intellectual pursuits; also for turning light fancy work, and gardening; and a great dislike to the excitement, and especially the noise, of London. Indeed, at the age of sixteen he had a severe nervous illness, with great depression, brought on by application to business in the City; it ought, however, to be mentioned that his occupation was not at all intense, and nothing would have been thought of it by ordinary men."

Now this is worthy of note, because in this instance there was no possibility of the cerebro-spinal fluid escaping from the interior of the brain. Whatever pressure might be made, by mental occupation or physical exertion, upon the internal parts of the brain or the medulla oblongata, would be morbidly manifested, in consequence of there being no possibility of escape for the cerebro-spinal fluid. Or to put it in another way: Suppose over-exertion or any moral influence to produce an excessive accumulation of blood in the head, there was no possibility, in this instance, of insuring a proportionate escape of cerebro-spinal fluid, because there was no aperture to allow of it.

"His food was always of the simplest kind. Even tea, coffee, and cocoa seemed to affect his head and derange his stomach; and he had an instinctive dislike to alcoholic stimulants of every kind. Though subject to coldness of the extremities, he could not bear a warm room, as it made him feel faint. Both winter and cold always affected him injuriously. He said himself he only half lived in the winter; he seemed torpid, and would drop into a deep sleep after a meal, from which it was often difficult to rouse him at bed-time, when he seemed scarcely to know where he was. Excitement frequently brought on an impediment in his speech. For many years he was subject to headache, derangement of stomach, and occasional deafness."

We have here, if we may so term it, a most important and valuable living experiment. Here is a man who cannot bear any accumulation of blood in his brain, because there is no possibility for the compensatory fluid to escape from the pressure or state of congestion of the organs in the interior of the skull. I conclude that we find the cause of the stomach affection and the deafness in the great distention of the fourth ventri-

* The student will remember that the two structures which in this case presented abnormalities, viz., the brain and the appendages of the cuticle, are developed from one and the same blastodermic layer, *i.e.* the epiblast. So also in some cases of spina bifida, not only is there an abnormal condition of the spinal cord, but the skin over the tumor is sometimes congenitally deficient or entirely absent, the spinal dura mater or arachnoid taking its place.—[Ed.]

cle, and the consequent pressure upon the pneumogastric and auditory nerves on its floor. If the fourth ventricle be filled with fluid, it must for the time exert some pressure upon the auditory nerve, thus explaining the temporary deafness.

"His pulse was usually extremely weak, irregular, and slow, from 50 to 60 beats per minute. He was thought to be suffering from heart disease. A peculiar restless, uneasy look of the eyes and stare, with dilated pupils, and a muddiness of the conjunctivæ, afforded a ready indication of any temporary derangement of his health. For the last year of his life he was gradually losing flesh; he became more feeble, too, and acquired a slight stoop in his gait. He also carried his head peculiarly, as if affected with slight stiffness of the neck." [This is the way in which hydrocephalic patients carry their heads.]

"A few months before his death, while in the country, he had a severe attack of vomiting, with great prostration, without any apparent cause. The last month or two were marked by a morbid activity and restlessness. Amongst other things, he became greatly excited about the preparation for a scientific meeting; and this was followed by great prostration and collapse. On the day of his death he had been to the Crystal Palace. He had had some vomiting in the morning, and again about two hours before he reached home. He walked from the Crystal Palace, and when he entered the room he staggered, and said he felt giddy and oppressed. He was placed on a bed, and cold was applied to his forehead; but he died in a short time with stertorous breathing [indicating pressure upon the medulla oblongata], but was sensible almost to the last moment."

If I were to select this opportunity to enlarge upon the apposite circumstances of this case, perhaps I might do so at too great length. I will merely observe that I think it an important and interesting experiment in reference to the circulation through the brain, the administration of food and stimulants, and various other matters. His brain could bear no fulness of blood, no increase of size, because the cerebro-spinal fluid could not escape from the interior of the brain. He could not take wine, beer, or spirits; and could bear no muscular exertion. The congestion of the brain produced vomiting by pressure upon the medulla oblongata, exerting its influence upon the pneumogastric nerve. He died from pressure upon the medulla oblongata, with stertorous breathing—that pressure which could not be obviated. I shall dwell no longer either upon this case or this kind of case, but I think that occlusion of the cerebro-spinal opening is a pathological condition which has not received due attention from the profession.

Before quitting the subject of the circulation through the brain, let me say that I think it is generally supposed that during sleep the brain is in a state of congestion, or, rather, overcharged with blood; and that it is the pressure of that blood which in some measure induces or sustains the state of repose or cerebral quietude. Mr. Durham, one of our demonstrators at Guy's Hospital, has put into my hand this paper, containing the result of some experiments which tend to show that the brain is not in that condition during sleep; that it loses its congested character in order that it may assume what we should call its state of quiescence, or rest. The facts are very few, and they shall be allowed to speak for themselves.

"A dog having been chloroformed, a portion of bone, about as large as a sixpence, was removed from the parietal region of the skull by means of the trephine; the subjacent dura mater was cut away, and the surface

of the brain exposed. As long as the animal continued under the influence of the chloroform, the smaller vessels of the pia mater were turgid with dark-colored blood, and the larger veins were considerably distended.* No difference in color between the arteries and veins could be recognized. The exposed portion of the brain manifested a tendency to rise into the opening through the skull. By-and-by the immediate effects of the chloroform passed off, and the animal sank into a comparatively natural and healthy sleep. A very marked change in the appearance of the brain accompanied this change in the state of the animal. As sleep supervened, the vessels gradually emptied themselves; the veins ceased to attract notice by their distention; the exposed surface of the brain sank down to, or below, the level of the opening, and became pale in color. In the course of a short time the animal was roused, and irritated. A blush seemed to start on the surface of the brain; the vessels of the pia mater became fuller and fuller, and of a bright arterial hue. The contrast between the appearance of the brain during this state of functional excitement and the previous state of quiescence was most striking. The more the animal was excited, the fuller of blood did its brain appear to become, and the higher did the exposed portion rise above the general level. When the animal was allowed to return to its state of repose, the brain again sank down, and reassumed its pale aspect." †

I have dwelt thus far upon the subject of rest considered as a physiological agent almost exclusively, and attempted to show how important a feature its production appears to occupy in Nature's plan of development and for sustaining health. This I have felt to be necessary as an introduction to the consideration of rest as a therapeutic agent.

Mr. Prescott Hewett, who preceded me here, has dwelt so largely and so comprehensively on injuries to the head, that I am almost ashamed even to approach the subject, except as an admirer of the monument which he has raised to himself. I would, however, solicit the attention of the profession to what observation has taught me—that recognized lesions of the brain and its membranes, associated with blows upon the head (whether the cranium be fractured or not), do not generally, or as a principle of treatment, obtain that extent of mechanical rest which is consistent with the expectation of perfect and complete structural repair. This error in the treatment of such cases is one of the chief sources of the diseases of the brain and its membranes which we meet with in practice. I must also claim your indulgence to employ a very short time in reference to the subject of what we term concussion of the brain or spinal marrow, for the purpose of indicating the value of rest with respect to injuries of those parts when they have been in a state of concussion.

If a man receives a severe blow upon his head which produces symptoms of compression of the brain, we at once admit that the cause is suffi-

* Further experiments of Mr. Durham showed that this fulness of the veins was caused by the temporary interference with respiration due to the administration of the chloroform; as soon as the dog was perfectly under the influence of the anæsthetic, the brain became pale, very much as during sleep.—[Ed.]

† A full account of these and other confirmatory experiments and observations was read at the British Association Meeting at Oxford in 1860, and was subsequently published in the Guy's Hospital Reports, 3d Ser. vol. vi. p. 149. As Mr. Power has remarked in the Principles of Human Physiology, of which he is the editor, 8th edit. p. 754, Mr. Durham's facts have been corroborated by some observations made by Dr. Hughlings Jackson, Royal Lond. Ophth. Hosp. Rep., on the ophthalmoscopic condition of the retina during sleep. In these the optic disc was found to be whiter, and the neighboring part of the retina more anæmic, than in the waking state.—[Ed.]

cient to produce the symptoms; and as long as these symptoms remain, we are disposed to think that the cause or its effects continue. Let us apply the same kind of reasoning to the subject of concussion of the brain. There are one or two cases to which I have before alluded, showing clearly that a patient may die with symptoms only of concussion of the brain; while the real cause of death may be laceration of the brain. Another cause of death with symptoms of concussion will occasionally be found. For instance, a patient has had a severe blow upon the top of the head, and dies; and yet no structural lesion or cause of death is found at the post-mortem examination. But I suspect that, if in such cases the base of the brain be carefully examined, the cause of death may be discovered in injury to the filaments of the pneumogastric nerve, near their origin from the medulla oblongata. Some years ago, I clearly made out this lesion in a case of concussion which caused the patient's death; the only indication of local mischief which I could discover was the laceration of some of the filaments of the pneumogastric nerve.

In concussion of the brain, as soon as the blow which strikes the skull has caused the symptoms of concussion, the physical disturbance of the brain, whatever it may be, has been produced. The continuance of the symptoms must depend on the continuance of the structural or molecular disturbance. But the actual condition of the brain is not known, and, as far as I am aware, has received no clear explanation. Experience shows that the symptoms may last a long or a short time, varying from days to weeks. If you ask what is the pathological condition of the brain in a state of concussion, I believe there is no satisfactory answer to be given; but the generally received opinion is that it results from disturbance of the vascular system of the brain. I cannot conceive it possible that a long continuance of the symptoms of concussion can depend upon any temporary error of this kind; I think it must depend upon something more intimately associated with the structure of the brain itself. One of the most important results of concussion of the brain is "collapse," or "shock," employing that term as we employ it in cases of local injury to the exterior of the body in which the structures are not destroyed, but bruised or concussed. That the function of the part is rendered very imperfect, is evidenced by the insensibility of the bruised skin, and its coldness or diminished temperature. These conditions of the integuments may continue for some time, but ultimately, without loss of structure or function, the recovery is completed, although it may be deferred to a considerable period after the accident. In the latter case of external bruise, before and until the recovery is complete, the surgeon secures as much rest as possible for the injured parts, not allowing them to be moved or stretched. Relying chiefly upon Nature's own efforts to repair the injury, he employs but slight means to prevent the total death of the part—to help, if need be, the reaction or return of function, and to anticipate the occurrence, or resist the effects, of inflammation.

Now, with all due deference, I venture to think that the considerations applicable to external injury ought to indicate the principles of treatment to be adopted in cases of concussion of the brain. No doubt our duty should lie in this: to give the brain absolute rest; to rely on natural reaction, or Nature's power to repair the injury or disturbance; to avoid stimulants, which excite quick reaction, and have a great tendency to do mischief, as much as possible. I suppose that a more serious error can scarcely be committed by any surgeon who is attending a concussion of the brain than to hurry on reaction by excessive stimulation. What-

ever the derangement of structure may be which coexists with this condition of concussion of the brain, the structure itself is undoubtedly deteriorated. If that be over-stimulated through the medium of excitants, such as brandy and ammonia (sometimes given in unmeasured quantities), the whole tendency *must* be to do harm at the period of reaction. Should we employ stimulants in that reckless way in the case of external bruises? If not, then I see every reason why we should not adopt such a plan in the case of the more delicate and highly vascular structure of the brain. Let us keep down any excessive temperature by the local application of ice, avoiding animal food, except milk in a definite quantity.

I make no pretensions to anything new in this statement. It is only a simple mode of considering such cases, and is, I believe, the true interpretation of what may be required to guide us in our principles of treatment of concussion of the brain. Such a disturbed brain is defective, if not in structure, certainly in its vital endowments, and is therefore unequal to even its ordinary duties. It recovers itself slowly; it then soon becomes fatigued from use; and if claims are made upon it too soon after the injury—that is, before the structural and physiological integrity is reacquired—the patient is very likely to suffer from serious disease of the brain. Cerebral exercise or mental occupation should always in such cases be short of fatigue. The brain requires absence from occupation, or *rest*, for its complete recovery, and this should be in proportion to the severity and duration of the symptoms of concussion; in fact, the length of time which has been required by Nature for the repair of the injury must be in proportion to the severity of the local injury.

The intention of these remarks is to secure due and continued rest to a brain which has suffered concussion, and to avoid the too early return to occupation, which leads, or may lead, to more obvious and serious chronic lesions, such as failure of mental powers, softening, chronic inflammation, extravasation of blood, &c. All I have stated is analogous to what is observed in collapsed or bruised parts upon the exterior of the body. Thus, when those external parts have apparently recovered from the immediate effect of local injury, they are likely, if too early or too much used, to become painful—suggestive of need of rest—and to assume a chronic inflammatory condition, resulting in local thickening or ulceration. The surgeon ought most circumspectly to guard the brain in this state of concussion, keeping it most carefully under his professional surveillance and protection during its prolonged convalescence.

Every experienced surgeon will support the opinion that a great many of the chronic brain affections which he meets with in practice are the result of local injury. A transient shake of the brain, slight or severe blows, a fall upon the head, the immediate effects of which having passed off quickly, may have been almost forgotten; or a sudden rebound or recoil of the brain, as in railway collisions, produce a condition of confusion for a short time, and are then thought of no more. Again we often hear of sudden deaths occurring a long time after concussion of the brain. I would suggest, then, that we ought to consider a brain which has been subjected to concussion as a bruised brain, not necessarily accompanied by laceration of substance or extravasation of blood, but as having suffered molecular disturbance in its exquisitely delicate structure. In cases of injury of what may be called the coarser structures with more simple functions attached to them, we see that without perfect restoration of the structures, their functions are not efficiently performed. Such soft parts having simple functions require weeks or months, or longer, for

their complete repair; surely, then, we ought not to deny the necessary and proportionately much longer time for the repair of the more delicate brain tissues: a repair, be it remembered, which cannot be accomplished by any direct aid from the surgeon, but only by Nature herself employing her chief agent—Rest. I believe that if this principle be adopted by surgeons generally, and the plan carried out, we shall not witness so many chronic diseases of the brain.

I have thought it right to make these brief observations in reference to concussion of the brain. I will now add a few words respecting concussion of the spinal marrow, in which a patient may experience slight and temporary numbness, or inability to control his legs and arms—a condition, I think, more frequently met with than formerly, probably on account of the prevailing kind of railway accident. I will state a case of concussion of the spinal marrow thus:—

A gentleman falls, without violence, with his back upon the hard ground or soft turf. There is no mental confusion, no cerebral disturbance. He feels a transient, peculiar sensation—" pins-and-needles "—in his hands and feet; he gets up; walks or rides home; feels little or no inconvenience; makes arrangements for the morrow; but in the morning is unable to get up, because, he says, he is in pain all over; he feels sore and stiff, just as if he had been bruised, making it painful for him to move his limbs.

What has happened in this case? It is possible that the spinal marrow, obeying the law of gravitation, may, as the body falls, precipitate itself in the same direction, fall back towards the arches of the vertebræ, and be itself concussed in that way. Or the little filaments of the sensitive and motor nerves, which are delicately attached to the spinal marrow, may, for a moment, be put in a state of extreme tension, because, as they pass through the intervertebral foramina, they are fixed there by the dura mater; and if the spinal marrow be dragged from them, the intermediate parts must necessarily be put upon the stretch, producing at the time the " pins-and-needles sensation," and also explaining the symptoms felt on the following day. He has not caught cold; he has no rheumatism; nor has he been bruised. The stiffness which he feels is not the result of the local injury. He has received no blow where the pain is experienced. No such explanation will apply. These symptoms must all depend upon something which occurred when he fell. Has he stretched the trunks of the nerves, or the little filaments forming the roots of the nerves? or has the spinal marrow itself suffered molecular disturbance? No doubt that sensitiveness of the surface, which creates pain on being touched, and the stiffness which he experiences, are the result of something which has disturbed the sensitive or motor nerves conjointly or individually, according as the function of one and not the other has been disturbed; or the mischief may have occurred in the interior of the spinal marrow. It is impossible that these symptoms could be the result of anything but some such structural disturbance; and they are, to my mind, the evidence of decided injury to the nerves or marrow, although what that injury may be is not ascertainable. It is the same when the spinal marrow has been impaired by a blow, or direct force; by a shake or a to-and-fro motion, such as occurs in railway collisions, in which the marrow is least efficiently defended from external injury by the mechanical contrivance employed in the construction of the vertebral column. The deterioration of function which follows such accidents must be the effect of some kind of structural disturbance, for it occurs immediately after the blow. It is a shock to the spinal marrow. At least, that is the most

reasonable light in which to consider it, especially with reference to the proper treatment.

The object here should be to give the marrow rest from occupation by not allowing the patient to take walking exercise at all; or if at all, the exercise should be short of fatigue; certainly he should not be advised to endeavor to "walk off" his condition. There seems to be an impression in the minds of the non-professional public that if a man receives a concussion of his brain or spinal marrow, or has a fall which gives him the same sensations, the best plan is to "run it off." A little while ago I had occasion to see a gentleman in the country, who had a fall upon his back at Epsom a few years since. The accident occurred from some scaffolding giving way. When he fell, he experienced the sensation of pins-and-needles in his legs. He was a most energetic man, and he set off and ran six miles. When a boy he had been told that if he ever had an accident of that kind he should run it off as quickly as possible. Within a very short time he began to have spinal-marrow symptoms, which have resulted in complete and irremediable paraplegia. I firmly believe that if, upon receiving the injury, he had gone home, and kept himself quiet and not used the spinal marrow for a considerable period, he would have been well at this time. It is this misdirection, this misuse of early exercise after a shock to the spinal marrow, that leads to more serious mischief—to a chronic inflammation or softening of the marrow, which probably remains incurable.

I have seen many such cases of concussion of the spinal marrow, and some of the patients have been thought to be malingerers. A patient who has suffered such a concussion perhaps continues his active exercise, takes no rest at all, or, after two or three weeks of rest, he may begin to resume his ordinary duties, but with some little difficulty in walking. In a few days, or a week or two, it is observed that the legs become feeble; there is a little jumping of the legs at night on going off to sleep, some sense of coldness in the limbs, slight dulness of sensation in the surface of one or both limbs, or of parts of one or both limbs. Then, perhaps, he is ordered by his surgeon to increase his exercise, so as to overcome the effect of disuse, especially if he is thought to be a malingerer. This increases the exhaustion of the spinal marrow, and the plan, if persevered in, most probably leads to paraplegia.

The confirmation of the accuracy and applicability of these views is, I think, made apparent when it is added, that all these morbid effects of concussion of the spinal marrow are to be prevented, relieved, or cured by due and long-continued rest.

The experiment to which I shall now allude proves our capability of exhausting the excito-motory functions of the spinal cord. A person receives a fracture of the spine, which produces the destruction of continuity of the spinal marrow in the dorsal region, leaving a portion of the spinal marrow perfect below the line of severance. If you tickle his feet, you excite involuntary movements in the lower extremities, through that excito-motory function which is apparently dependent upon the gray matter in the centre of the spinal marrow. You continue to excite by this means the movements in the muscles of the toe, foot, or leg, for some time, and you mention the patient's case to some other person, and ask him to go and see a specimen of excito-motory function. He goes immediately to the patient, tries the experiment, but fails; he cannot excite motion. You see the patient again in a few hours, or on the following day, and perform the experiment successfully. The movements are visi-

ble, continue for a short time, and then cease; on the next day, perhaps, they reappear. Here, then, we have evidence that by over-excitation, which is equivalent to fatigue, we exhaust or destroy for a time the true function of the spinal marrow; and I accept the result of the experiment as an indication that by over-exertion, after concussion of the spinal marrow, we may injure it by requiring it to do more than it is competent to accomplish without fatigue.

The obvious intention of these remarks is to suggest that in cases of concussion of the spinal marrow by accident, it should have more rest than is usually allotted to it, in order that it may not suffer physiological exhaustion by premature and too vigorous exertion before its structures have repaired themselves. Experience distinctly points to this recommendation; since we observe that after many months or a year or two, such patients may recover perfectly. On the other hand, recovery is sometimes rendered incomplete by the persistent loss of sensation or wasting of some part. This persistent loss, I apprehend, has reference to some distinct defect of structure in some minute filaments either of the spinal marrow or the nerves themselves.

I thought I could hardly pass over the subject of concussion of the spinal marrow without adducing these few observations, which I think have an important bearing on the function of the spinal marrow, and manifest the necessity for keeping it in a state of rest after accident. I trust also that these remarks will have a tendency to promote improved treatment of such forms of concussion.

A few weeks ago a surgeon from the country came to my house with a patient. He said, "I want to consult you about a young lady who has a diseased toe." With her was a relative, an elderly gentleman, a very kind-hearted man, who thinks himself a good surgeon, and goes about doctoring people, sometimes doing harm, and sometimes perhaps a great deal of good. He is very fond of animals, and has a number of pets. After I had examined, with the surgeon, the lady's toe, the elderly gentleman said, "Well, Mr. Hilton, what are you going to do to cure this young friend of mine?" I said, "I think we shall put a splint on the foot and keep the toe very quiet, attend to her general health, and Nature, in all probability, will do the rest." I then said to him, "What led you to adopt the occupation of a philanthropic surgeon in addition to your other occupations?" "Well, Mr. Hilton," he replied, "I will tell you. You know I am very fond of animals. Some years ago I caught a live mouse in a trap. I took it in my hand, and I said to myself, 'Poor thing! you must have suffered a good deal. You have had a severe laceration of your cheek; one of your eyes has been torn out; your skull has been broken, and, instead of having bone covering your brain, you have now only a thick dense membrane defending it.' Then I thought to myself, 'This mouse must have had difficulties in the treatment of its injuries; and'"—interrupting the relation of his story, he said, "I hope you won't be offended at what I am going to say?" "No," said I, "not in the least." "Well," he continued, "I said to myself, 'Surely this mouse, although it is cured, never had a physician or a surgeon!' I quite agree with you, Mr. Hilton, that Nature is a very valuable surgeon."

It would be well, I think, if the surgeon would fix upon his memory, as the first professional thought which should accompany him in the course of his daily occupation, this physiological truth—that Nature has a constant tendency to repair the injuries to which she may have been subjected, whether those injuries be the result of fatigue or exhaustion,

of inflammation or accident. Also that this reparative power becomes at once most conspicuous when the disturbing cause has been removed: thus presenting to the consideration of the physician and surgeon a constantly recurring and sound principle for his guidance in his professional practice.

As illustrations of this truth take the following:—An extraneous body falls upon the conjunctiva; it is immediately pushed, by repeated involuntary closure of the eyelids, towards the angle of the eye, close to the puncta lachrymalia; thence the lachrymal fluid floats it upon the caruncula lachrymalis, where it becomes entangled by the hairs with which this structure is provided. So long as the extraneous body remains upon the conjunctiva, the redness, pain, &c., continue; but after its removal by the surgeon or Nature, the whole of the inflammatory appearance vanishes, showing that it was only necessary to remove the disturbing cause. If there be a thorn in the finger, you have but to take it out, and the local irritation subsides. Suppose you have a fish-bone in the throat, exciting constant involuntary efforts of deglutition—as soon as it is removed all the disturbance in the throat ceases. An in-growing toe-nail produces great pain and local inflammation: if you take off the edge of the nail, all these symptoms quickly vanish. Corns get well if pressure be taken from them. I admit that this is all very simple surgery, but it illustrates a principle—that if the local disturbing cause, whatever it be, is removed, Nature has an immediate tendency to repair the injury which has been inflicted, because she is enabled to adopt her own remedy, Rest.

This subject at first sight may appear to have but a small application in practice, especially when looked at through the biassed vision of those who think that in the treatment of disease or accident everything is to be done by medical or surgical aid. But I feel convinced that, under the most favorable circumstances, all that any of us can accomplish is to give rest to the parts, and enable Nature, through her own efforts, steadily to play her part, whilst we, as Nature's willing servants, act in the hope that, by the use of appropriate mechanical applications, aided, if necessary, by soothing medicines, and by the use of properly adapted diet, we may facilitate her efforts to repair the injury she may have sustained. In fact, nearly all our best-considered operations are done for the purpose of making it possible to keep the structures at rest, or freeing Nature from the disturbing cause which was exhausting her powers, or making her repeated attempts at repair unavailing. The operation does not cure; it only makes recovery possible, where, without the aid of the hand or head of the surgeon, Nature would have ceased her competition with the results of the injury, or succumbed to the exhausting influence of disease. In aneurism—I think I am not in error when I say that aneurism is cured by rest, and not by the surgeon—the surgeon takes care to stop the blood, or to moderate its flow; Nature herself actually cures the disease by rest. So in all operations for hernia, the object is to give the intestine rest and freedom from pressure, both immediately after, and for a long time subsequent to the operation. Most of us now act upon this principle. We take care not only not to disturb the intestine by purgatives, but we give opium to arrest peristaltic action. We know that the gut has been damaged in its function and structure, and will not bear excitement; that it requires rest and quiet to enable it to repair itself. Sometimes we carry this so far at Guy's Hospital, that one of my colleagues, Mr. Birkett, mentioned to me that in a case of operation for strangulated hernia, the bowels had not been opened up to the twenty-

first day, and the question was asked, "What shall I do? Shall I give anything to the patient?" The reply was, "I think not;" and in the afternoon of the same day the bowels were well relieved. In chronic laryngitis, cured by tracheotomy, the cure is not effected by opening the larynx, but by giving the larynx rest. The operation is performed in reference to these two circumstances — in reference first, no doubt, to securing the continuance of life by allowing the patient to breathe through the tracheal tube; secondly and ulteriorly, the object is to give rest to the diseased part. In the performance of tracheotomy for disease of the larynx, the surgeon never touches the disease at all; he merely enables the patient to breathe through the tracheal tube, and diverts the stream of air away from the larynx, thus giving the larynx the opportunity of recovering itself. It is marvellous to see what happens in a few hours after the trachea has been freely opened in cases of traumatic injury to the top of the larynx, such as occurs from the accidental local application of scalding water.

And here I might remark upon the striking difference in the successful results of tracheotomy in cases of traumatic injury to the upper part of the larynx, as compared with the want of success of the operation in cases of diphtheria or croup. In the latter cases the patient may have a tube introduced into the trachea, and may breathe through it for a considerable time, yet the diseased condition of the larynx remains, and is often fatal. It is not like the simple effect of a local injury: the seat of the local injury being kept quiet, the inflammation subsides, and the larynx rapidly recovers; whilst in the other case, of diphtheria, whatever may be its cause, it still persists. Hence tracheotomy has not been successful as a curative operation in such cases.

I may mention the case of a patient upon whom I performed the operation of tracheotomy twelve or thirteen years ago, to prevent suffocation from syphilitic ulceration of the larynx. She has lived by breathing through the tube ever since, scarcely any respiration going on through the upper part of the larynx, the air which passes through this not being sufficient to bend the flame of a candle. I need scarcely add, the voice is totally lost, but she is not disposed to have any further operation performed in reference to clearing the upper part of the larynx, and the tube is still worn in the trachea.*

So, again, if a portion of bone be pressed in upon the skull, you have only to remove it and give the brain rest, and the brain will repair itself. It is not the operation that cures the injury to the organ, but, by removing the disturbing cause, the brain recovers itself. I might allude also, in the same spirit, to the operation of lithotomy. Stone is not the disease, although it is the cause of the symptoms. The patient does not complain of stone, but of the pain and irritation which the calculus induces within the bladder. If a patient has a stone in his bladder, it does

* I have lately (April, 1876) seen this patient. She is now sixty years of age, it being twenty-eight years since tracheotomy was performed for the relief of laryngitis, probably of a syphilitic nature. She has worn a tube continuously; her voice as such is quite gone, but by a hoarse whisper and movements of her lips she makes herself intelligible. As Mr. Hilton has observed, it is to her very small size, and therefore small respiratory needs, that her having lived so long is to be attributed. On recently changing her tube, the external opening and her very small trachea only admitted a tube of a child's size, and (showing the value of good silver tubes) the patient informed me that the tube I removed had lasted six years. The tape-holes were almost worn through, but the rest of the tube scarcely affected. — [Ed.]

not necessarily follow that an operation should be performed. The same symptoms are sometimes produced when there is no stone at all. Perhaps you have a little ulceration of the bladder or prostrate, with all the indications of stone. No surgeon can tell whether it is stone or not till he has explored the bladder. Those are the symptoms complained of, and by removing the stone you simply make it possible for these symptoms to be subdued by giving the parts rest. I have a gentleman under my observation who has had stone in the bladder during many years, probably for more than twelve. I discovered the stone ten years since. He is now seventy-four, and the only inconvenience he experiences is occasional and slight hemorrhage from the bladder. He is always relieved by maintaining the recumbent posture. Having recently treated him for nasal polypi, I asked him, "How is the other affair?" "Oh," said he, "I have nothing the matter there, as far as I know; I am quite well." Stone, then, is a disease requiring operation, because it induces a derangement of the structure which produces certain painful symptoms, and by removing the cause the part gets well—first, through the assistance of the surgeon, but ultimately through the medium of Nature.

LECTURE IV.

Coagulable Lymph a means for Securing Rest to Inflamed Serous and Mucous Membranes—Pain with Increase of Temperature a sign of Inflammation in the Part where it is Felt—Diagnostic Value of Sympathetic Pain—Disease of the Vertebræ Indicated by Pain over the Lower Part of the Abdomen and Pubes—Knowledge of the Accurate Distribution of the Various Nerves to the Head and Ear, Leading to a Diagnosis of the Distant Diseased Organs causing Sympathetic Pain in those Parts—Pain between the Shoulders an Indication of Visceral Disease—Pain over the Stomach in the Region of the Cutaneous Distribution of the Sixth and Seventh Dorsal Nerves a Sign of Vertebral disease.

In my last lecture I said that I thought it would be well if every surgeon would fix this upon his memory, as his first daily professional thought, that Nature when undisturbed has a constant tendency to repair her own injuries, whether those injuries be the result of fatigue, of accident, or of inflammation. I had proposed to extend these observations to the consideration of the means adopted by Nature to obtain a proper degree of rest in her affections of serous and mucous membranes after they have been the subjects of an inflammation. Although time will not allow me to do justice to the subject, I cannot pass it over without a few remarks.

Serous membranes are secreting and absorbing organs. If a serous membrane be wounded, coagulable lymph is poured out, and it forms a temporary splint until the original structures repair themselves; in this way the inflammatory effusion produces a certain degree of rest to the original structures, and thus contributes to the work of reparation. The inflammatory effusion forms no necessary part of the ultimate bond of union; it merely holds the parts firmly in close apposition, and keeps them so until the union is perfected; and when the union in the original tissues is rendered complete, this temporary medium, or splint, employed by Nature completely disappears. Thus we find that when a serous membrane is inflamed, the lymph which is poured out (as the result of a wound at least) keeps the parts in an accurate position and maintains them so until Nature has healed up the wound in the original tissues, when the lymph is absorbed. This is analogous to what we see in the case of fractured bones. When a fracture is not nicely adjusted, or much disturbance has taken place, Nature throws out a large quantity of new material, termed callus, which keeps the fractured bones accurately in position for a considerable length of time, until they have repaired themselves, and when they have achieved that object, the callus entirely disappears.

This subject, perhaps, receives its best and most practical illustration in cases of wounds to the viscera, and, no doubt, when looked at in this light, it suggests to every surgeon the great impropriety of doing anything which at all tends to disturb the parts, in wounds of serous membranes. This subject, however, I cannot enlarge upon at the present time. I would ask you to suppose a serous membrane inflamed. What happens when this takes place? When it is not traumatic, but depend-

ent upon some internal cause (quite irrespective of any direct local lesion), almost immediately a considerable quantity of lymph is effused, and this, after a time, coagulates spontaneously upon the free surfaces of the serous membrane, and thus at once prevents the ill effects of further friction. If inflamed serous membranes are allowed constantly and freely to rub upon each other, it is impossible but that the irritation must be considerably increased; but by the coagulation of the lymph upon the free surfaces, they are protected against direct friction—such is the case in the opposed surfaces of the abdominal viscera and their parietes, or in the heart and the opposed surfaces of the pericardium. As soon as the lymph is poured out, the serous membrane, as far as it can be, is put in a state of rest, or freedom from friction. When the original disturbing cause has become exhausted or removed, then I apprehend that, in consequence of the rest which the serous membrane has experienced through the effused lymph, it is able to recover or resume its normal function of rapid absorption. Thus we see the effusion apparently performing two purposes—preventing the friction between the two inflamed surfaces, and, that being accomplished, giving Nature a fair chance of removing the original disturbing cause. Here the rest has so far contributed to the restored integrity of the serous membrane, that it has enabled it to recover its natural function—that of rapid absorption, and the first act of its renewed health and vigor is to absorb that effusion which was the primary result, whatever the disturbing cause might have been. Thus, then, the lymph prevents friction, and aids absorption. In this way, I apprehend, Nature does her best to repair injuries, whether they be the result simply of accident or other excitants of the inflammatory condition.

I would ask you to bring to your recollection, for the moment, what happens when a mucous membrane is inflamed. When a mucous membrane is very much inflamed, coagulable lymph is poured out upon its free surface, and from that moment the membrane is defended from the influence of external agents. In the case of the larnyx and trachea, it prevents the contact of the irritating external air passing over the inflamed surface, and in that way gives the mucous membrane rest. And when the disturbing cause, whatever it may have been, has disappeared, the mucous membrane having had this advantage of rest, the secreting glands and follicles recover themselves, and pour out a fluid between the mucous membrane and the effused lymph; the latter is thus separated, pushed off from the internal surface, and becomes expectorated. This is seen in the little preparation before me. Here is a portion of lymph partially separated by Nature, as the result of the rest which the mucous membrane seems to have obtained by the effusion of the lymph. These glands and follicles, when inflamed, do not secrete their fluid normally, either in quality or quantity. By means of rest, however, they have the opportunity of recovering themselves, and when they have done so, their abundant and natural secretion is interposed between the mucous membrane and the lymph. The lymph is thus pushed off, and becomes expectorated or swallowed. Sometimes, in the case of acute inflammation attacking the mucous membrane of the intestines, you may see long tubular portions of solid lymph discharged from the bowels, having at first sight the appearance of the intestine itself; but, upon post-mortem examination, it will be found that the originally inflamed portion of intestine has perfectly recovered itself, and has pushed off the lymph from the interior, precisely in the same way that the glands secrete their fluids and push off the lymph from the interior of the larnyx and trachea. I cannot pursue

the subject further, but I thought it right to mention these circumstances to show that a right interpretation of Nature's efforts demonstrates that when serous membranes and mucous membranes have suffered from a severe inflammatory condition, there are indications of attempts on her part to secure rest to these membranes, and thus contribute to a favorable issue.

As a preliminary to my observations on the beneficial influence of rest in the treatment of diseases of the spine, it will be instructive to remember that accurate diagnosis and early recognition of disease constitute two important steps towards successful treatment. It will be advisable, therefore, that I should preface the subject of spinal affections with some few clinical remarks on pain as a symptom of disease.

When a patient is suffering from pain in any part, he is instinctively inclined to believe that he must also be suffering from inflammation in that part. Pain, as we all know, is not by itself an indication of an inflammatory state, nor is redness, nor is swelling; for any or all of these may coexist without local inflammation. Increase of temperature or heat is the true sign indicative of a local inflammatory condition; and taking that as a single symptom, it is a most striking and valuable one in reference to the diagnosis as to whether a part is actually in an inflammatory condition or not. For example, if we apply the hand to the surface of an ulcer, nothing is easier than to determine whether it is inflamed or not; its true character may be recognized at once. In the minds of some surgeons there may be considerable difficulty in distinguishing what is termed an inflamed ulcer from an irritable ulcer; both look red and congested, and both are painful: but by placing the hand upon the surface of the ulcer, and feeling the increase of temperature in it and its immediate neighborhood, the inflammatory nature of the local malady is rendered evident. The real and essential pathological condition of an irritable ulcer I hope to prove to you before I have finished these lectures. We must also admit that the employment of the hand for the purpose of recognizing increased or diminished or normal temperature is a matter of great importance in determining the state of a diseased joint. It often happens that although a whole joint may be apparently unsound, yet there are certain parts of it which may manifest inflammatory symptoms more distinctly than others. These localities can be ascertained by the hand. This is useful knowledge, and clearly indicates the precise points where leeches, blisters, or counter-irritants should be applied. Again, I would submit to you that if, in very young children, this little (oftentimes repudiated) symptom of heat or increase of temperature had more credit given to it, and was more frequently observed, its diagnostic value would soon be appreciated. Suppose a little child to be lame: it may be very difficult for the surgeon to tell with precision the exact seat of the cause; but if, with his mind intent upon what he is doing, he passes his hand carefully, slowly, and gently over the whole surface of the limb, he will detect, by the increase of temperature, whether or not there be an inflammatory condition in any particular spot. It was in anticipation of what I am about to state with regard to the true value of pain as a symptom of disease, that I have not deemed it out of place to make such elementary observations.

Pain in any part, when not associated with increase of temperature (the local symptom of local inflammation) must be looked upon as sympathetic pain, caused by an exalted sensitiveness of the nerves of the part, and it is to be regarded as a pain depending upon a cause situated

remotely from the part where it is felt. In availing ourselves of these so-ealled sympathetic pains (and no doubt they are in a eertain sense sympathetic pains), I should like to displace, to throw aside, the term "sympathy" as something too ideal, and would ask you to eonsider such pains in their obvious, intelligible, and more natural relation. I would ask you to regard them as resulting from some direet nervous eommunication passing between the part where the pains are expressed and the real and remotely situated cause of the pain.

I admit that I formerly estimated this subject too lightly, so that if a patient complained of pain between his shoulders, or anywhere else, I never asked myself, What assoeiation of nerves will explain this pain? But, beyond doubt, this is the proper way of regarding this question. If the hidden cause of pain be in any one particular spot, it is only by tracing the nerves of and from that spot that we ean hope to arrive logically at the real cause of the symptoms, and so divest the ease of its obscurity. Applying this method to practiee, it is through the medium of the distribution of the cerebro-spinal nerves of sensation (the fifth nerve being the true cranial sensitive nerve) that we are enabled to explain those pains which are called sympathetic, but which result from a eontinuity of nerves between the cause and the effect, the disease and the symptoms. It is impossible, I believe, to overrate the practical significance, or over-estimate the value, of this simple statement regarding the relation of pain as a symptom of disease in forming the diagnosis of the kind of ease in which pain forms a prominent symptom.

When a patient complaining of pain applies to a surgeon, the surgeon ought to seek for the real eause. He ought not to be satisfied, as is too frequently the case, with saying, "Oh, it is rheumatism" (the favorite phantom). "You have caught a eold;" "you have been standing in a draught of air;" "it is the easterly wind, which has been lasting so long —wait till the wind changes." "It is gout." The patient says, "It eannot be; I live so carefully." "But," says the surgeon, "you have inherited it from your father or your great-grandmother; or you must have had a blow upon the part some time ago, which you do not recolleet —that is all."

Now external pain, or pain upon the surfaee of the body, if properly appreciated, may be considered as an external sign of some distant derangement. If the pain persists—if it does not depend on any transient eause—it becomes necessary to seek the precise position of the pain; and as soon as we recognize the precise position of the pain, we are enabled, by a knowledge of the distribution of the nerve or nerves of that part, to arrive at once at the only rational suggestion as to what nerve is the exponent of the symptom. By following centripetally the eourse of that nerve, and bearing in mind its relation to surrounding struetures, we shall, in all probability—indeed, most likely—be able to reach the original—the producing cause of pain, and, consequently, to adopt the correct diagnosis.

Patients judge of the position of their own disease, most frequently, by the situation of the most prominent painful symptoms, or those most palpable to their senses; whilst we surgeons, relying upon our knowledge of the true ease of the symptoms, judge of the seat of the disease by a just interpretation of the symptoms through the medium of normal anatomy. We know by experience that such symptoms may exhibit themselves at a spot far removed from the aetual seat of the disease. This latter remark is peculiarly applicable and pertinent to diseases of the spine.

In illustration of this, I may mention an instance that occurred to me some years ago in Guy's Hospital. A patient was admitted, under my care, with disease of the spine. He had lost the power of motion in his lower extremities, and his sensation was very much diminished below the pelvis; but he complained of exeessive pain over the lower part of the abdomen and pubes. It was there he believed his eomplaint to be; and I failed to convince him that there was no disease at that spot.

In this ease I might ineidentally remark on the close proximity of the two distinct nervous eonditions of diminished sensibility and pain. Below the pelvis sensibility was very much diminished, but just above that point he suffered excessive pain. This is in strict accordanee with what is observed in injuries of the spinal marrow, where a person may be completely paralyzed both as to sensation and motion; but a little higher up than the original seat of injury, there may be exquisite sensitiveness, causing the patient extreme pain. Let me illustrate the ease in this way. Suppose a fraeture of the spine, with eomplete loss of sensation, below a eertain spot. A little higher than that spot the sensibility is not very distinct, and, a little higher still, the skin is exquisitely sensitive. If the patient dies, we shall probably find that the nerves that supply the skin where the pain was experieneed are attaehed to the upper portion of the injured spinal marrow, near the seat of injury, whieh is in an inflamed condition. This is the reason of the exalted exeitability of that part immediately above the seat of the loss of sensation.*

I tried repeatedly to assure the man that there was no disease where he felt the pain—that that was not the seat of his disease; but I failed to convince him. I ordered tartar-emetic ointment to be rubbed over the diseased portion of the spine; but the patient would have it that the ointment ought to be applied where he felt the pain. He aeeordingly rubbed it in thoroughly over the lower part of the abdomen, amongst the hair of the pubes, and upon the penis and serotum; and, I need not tell you, he suffered considerably for his scepticism and his obstinaey. Of eourse the pain was not in the slightest degree relieved. The pain in this case was situated at the lower part of the abdomen, over the pubes; but the real cause was the disease of the vertebræ. After a time the man got perfectly well, although he had been paralyzed, and nearly lost sensation in the lower extremities, the treatment having been simply rest—nothing else—and attention to his general health whilst lying in bed.

When this patient was first seen by a surgeon, he was thought to be laboring under some disease of the bladder and kidneys; for he had severe lumbago, pain over the bladder, and offensive urine. There had been no

* As this area of hyperæsthesia may exist very shortly after the accident, when there has been no time for inflammation to have supervened, there must be some other explanation for this symptom. I cannot do better than quote in Mr. Hilton's own words another explanation given by himself in a clinical lecture (Guy's Hosp. Rep. 1865) on a case of fractured spine, where this hyperæsthesia was found to exist on admission immediately after the accident.

"This symptom may, I think, be explained thus. You know that the lower you get in the spinal canal, the longer is the distance traversed by the nerves which have come off from the spinal cord before they enter the intervertebral foramina. Each pair of nerves is placed more obliquely than the pair above it, and, to speak more precisely with regard to the site of injury in this case, the lower dorsal nerves, after having left the cord, travel downwards an inch and a half or an inch and three-quarters before leaving the spinal canal. Now, if a nerve in leaving the canal be pressed upon, an alteration in the performance of its functions will, of course, take place; and this alteration is manifested by pain or increased sensibility, which is referred to the peripheral distribution of the nerve on the skin."—[Ed.]

suspicion of anything wrong as regards the spine. He was a master painter and house decorator, and was monstrously conceited, thinking himself right and everybody else wrong. When I explained to him, after careful examination, that the spine was the cause of the symptoms, he was not satisfied with my opinion, and, without my knowledge, consulted Sir Benjamin Brodie, who also assured him that his spine was diseased, and told him that he must rest it by lying down. To this he then assented. As he could not be controlled in his own house, I persuaded him to go to Guy's Hospital, where he got nearly well; but he was very impatient, and would not remain long enough under my care to be quite cured. He returned home, gradually improved, and was getting quite well, when some pseudo-friend advised hydropathy and homœopathy—it did not matter which of the two—as "the thing" to cure him. After a few months he was perfectly restored, not by either hydropathy or homœopathy, but, no doubt, by Nature. The man, however, feels convinced that hydropathy and homœopathy cured him.

It so happens, gentlemen, sometimes that we do not get the degree of credit which perhaps belongs to us. Only the other day, I had a handsome present sent to me from a young lady of a pair of crutches which I had lent to her some four or five years ago. She had then severe disease of the hip-joint. I gave myself a great deal of trouble about her, and I believe I placed her joint in a comparatively healthy condition. Her note to me was —her compliments, and she sent back the crutches, having got well after five months' treatment under a distinguished rubber at Brighton. She had been under my care for a considerable period, and no doubt she completely recovered by five months' further rest and quiet at Brighton.



FIG. 11.—Sketch of external ear, showing the distribution of the fifth cerebral nerve, and the second cervical nerve upon it. *c*, The upper part of the ear, supplied by the auriculo-temporal branch of the fifth nerve. *d*, Auditory canal, supplied by the same fifth nerve. *b*, The part of the ear supplied by the great auricular.

In elucidation of my conviction of the value of pain as a diagnostic symptom, let me put the subject in a plain and practical way. You know that the upper and anterior part of the external ear and the auditory canal derive their sensibility from the fifth cerebral nerve, which has its direct nervous associations with the interior of the head, the forehead anteriorly, the temple, face, eyes, nose, teeth, and tongue; whilst the posterior part and the anterior part of the pendulous portion of the external ear derive their sensitive nervous supply from the spinal nerves issuing from the spine between the second and third cervical vertebræ. It may appear to some of my anatomical friends rather remarkable that I should have depicted (Fig. 11) the precise distribution of the two sensitive nerves supplying the exterior auditory apparatus. A curious circumstance enabled me to do so. Some time ago I was anxious to depict this piece of anatomy from my own dissections, but I did not feel quite satisfied as to the exact line of demarcation separating the part where the cervical nerve supplied the skin of the ear from that where the fifth nerve wasi distributed. A short time since, a man, who is now undergoing the punishment of penal servitude, attempted to cut his wife's throat. In

drawing the razor across her neck, he divided the auricular branch of the second cervical nerve, and gave me the opportunity of ascertaining the distribution of that nerve. My dresser, as well as myself, pricked with a needle over the whole of the auricular surface, and ascertained minutely the precise position of the loss of sensation consequent upon the division of the cervical nerve; whilst the skin which retained its sensation indicated with equal precision the distribution of the fifth cerebral nerve upon the external ear.

When a patient, then, tells us that he has earache, or pain in or upon his ear, we ought to ascertain whether it is pain upon the back part of the ear, or whether it is in the auditory canal, or upon the anterior and lower portion of the ear; because it is obvious that the real cause must be widely different in the two cases. If the patient has pain in the auditory canal, or the upper portion of the anterior part of the external ear, the pain must be, without question (I hope I shall not be considered as putting this too dogmatically), the result of some irritation or diseased condition associated with the fifth cerebral nerve, and this gives precision to further inquiry.

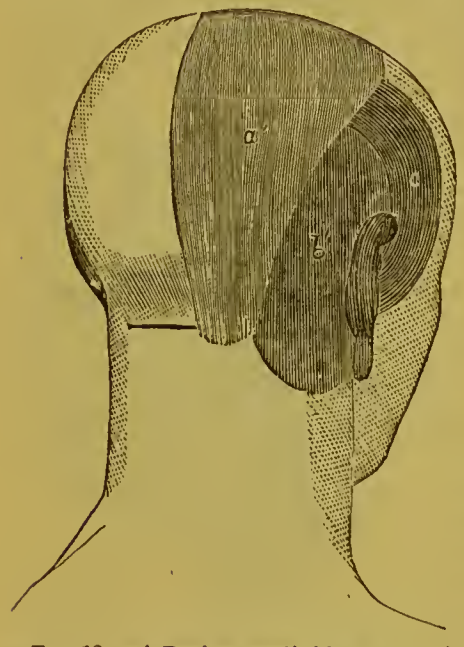


FIG. 12.—*a'*, Region supplied by great occipital nerve. *b'*, Region supplied by small occipital nerve. *c*, That supplied by auriculo-temporal.

Now, we know very well that there is often a simultaneous occurrence of toothache and earache. The same nerve supplying the auditory canal and the anterior portion of the ear supplies also the teeth; hence, in all probability, this associated pain. I think you may take a further step in the other direction, and say that earache is often accompanied with a stiffness of the jaws, the fifth nerve supplying the masticatory muscles which fix the jaw and also the articulation. So we know perfectly well that disease affecting any part of the anterior third of the tongue is a very common cause of pain in the auditory canal, the tongue and the auditory canal being supplied by the fifth nerve. These auricular pains are pretty constant in cases of malignant disease attacking the side of the tongue or the part towards the apex. Local morbid conditions are sometimes induced by irritating secretions which result from the free nervous communication between the different parts which derive their sensibility from the fifth nerve.

A professional friend had an enlarged gland below the external ear. The real cause of this was not quite apparent, and so he requested me to look at it. There was a slight discharge of morbid secretion in the auditory canal. We argued the question together, and I said: "Very likely it may be the result of a decayed tooth. Irritation from it may be conveyed to the auditory canal, and induce this morbid secretion; that morbid secretion may produce slight excoriation; and that excoriation, aided by lymphatic absorption, may explain the existence of the enlarged gland." The tooth was extracted, all the other local morbid conditions disappeared, and there was no recurrence of the local symptoms.

In order to show the practical application of the views I have just

advanced, I may mention a case that occurred last year. A gentleman, aged sixty-three, came to consult me about an ulcer situated upon the left side of his tongue. On examination, I found on elongated, very ugly-looking ulcer, nearly as large as a bitter almond, and of much the same shape. The surrounding parts were swollen, hard, red, and much inflamed, and a lymphatic gland was enlarged below the horizontal ramus of the lower jaw on the same side. I saw in the mouth a rugged tooth, with several projecting points upon it, opposite the ulcer. This gentleman observed to me, "Having suffered a good deal from earache on the left side for a long time, without experiencing any relief from medical treatment, it was thought that I must be gouty, and I went to a surgeon who treats gouty affections of the ear. This surgeon paid great attention to my ear, but certainly did not do it the slightest degree of good. I accidentally mentioned to him that I had for some time past something the matter with my tongue. On seeing it, he immediately began to apply caustic vigorously; moreover, not satisfied with applying it himself, he gave it to my wife, that she might apply it at home. I have gone on in this way from day to day until the pain in my ear is very considerably increased, and the ulcer on my tongue is enlarging: so I have come to you for your opinion regarding my state; for, to tell you the truth, I am afraid of a cancer in my tongue." I thought I saw the explanation of this patient's symptoms. The pain in the ear was expressed by the fifth nerve, and there was a rugged tooth with little projections upon it, some of which touched a small filament of the lingual-gustatory branch of the fifth nerve in the surface of the ulcer. I detected this little filament by placing upon it the end of a blunt probe. It was situated near the centre of the ulcer, and was by far its most exquisitely painful part. This exposed nerve caused the pain in the auditory canal which led him to go to the aurist, and the aurist, instead of confining himself to his own department, seized the tongue, put nitrate of silver upon the whole of the ulcer, and increased the mischief. I simply desired that the ulcer should be left at rest; that the patient, to avoid touching the tooth, should neither talk nor move his tongue more than necessary; that he should wash his mouth with some poppy fomentation, and take a little soda and sarsaparilla twice a day. In three days about one-third of the ulcer was healed up, actually cicatrized, the enlarged gland nearly gone, and the earache much diminished.

This rapid improvement might appear something like exaggeration, but all surgeons know that the tongue has those elements within it which contribute to the most rapid repair of injury. I do not know any tissue that repairs itself more rapidly. It is abundantly supplied with capillaries filled with arterial blood, and has an enormous distribution of nerves, and these are the two elements that contribute to rapid reparation. It was quite clear that the treatment was in the right direction—viz., that of giving rest to the tongue and ulcer. After a few more days I requested him to consult a dental surgeon with respect to the propriety of taking off the points of the tooth. This was afterwards done, and the patient soon lost his anxiety about cancer, his earache, and all his other severe symptoms.

I mention this case to point out the value and importance of recognizing the precise distribution of the nerves of any part where a patient is suffering pain. I thought I might take the surface of the external ear as a pretty accurate illustration of what I intended to convey. Last July a patient came to me with earache. The pain was on the lower part of

the ear—not the upper part, nor in the auditory canal. Looking at the neck, I saw a little swelling there, and the patient said, "Oh, that is only a kernel which comes down sometimes. I have been under my surgeon's care for some time for the ear, but am no better." It struck me that the kernel or gland, lying close to the second cervical nerve, was the cause of the pain. Hemlock poultices were applied over the gland, and in a week or so the gland suppurated; it was opened, and the painful symptoms disappeared. The patient had earache, and the symptoms were precisely expressed. There was no pain in the auditory canal supplied by the fifth nerve; the part of the ear implicated was that connected with the auricular branch of the second cervical nerve. It was the recognition of this distribution of the nerves to the ear which gave me the opportunity of detecting the real cause of the painful symptoms.

These cases support the opinion that accurate information respecting the exact seat of pain is a very important step towards obtaining a correct diagnosis.

Again, with respect to pain upon the head. Suppose a person to complain of pain upon the scalp, is it not very essential to know whether that pain is expressed by the fifth nerve, or by the great or small occipital? If it be expressed by the fifth nerve, it must be placed somewhere in front of the head, for all the anterior and lateral part of the head is supplied by the fifth nerve. Thus pain in the anterior part of the head would suggest that the cause must be somewhere in the area of the distribution of the other portions of the fifth nerve. So if the pain be expressed behind, the cause must as assuredly be connected with the great or small occipital nerve, and in all probability depends on disease of the spine between the first and second cervical vertebræ.

I add these illustrations in order again to fix in your minds the importance of ascertaining the exact seat of the pain of which a patient may be complaining. It is not enough to say that he has pain upon his scalp; we must know precisely on what part of the scalp. It is not enough to say that he has pain in his ear, but upon what part of the ear; because there are two distinct nerves connected with these two different parts. I advance these local illustrations to indicate the proper method of exploration of the causes of pain, in whatever part of the body they may occur, although my remarks are here especially applied to the surface of the body.

"Sympathetic" pains on the surface of the body, connected with derangements of the internal viscera, are of great and pressing interest to us. I conceive that pains situated upon the surface of the body, and associated with some abnormal state of an internal viscus, must be looked upon as a beneficent provision, enabling us by external pain to receive the information and to appreciate slight organic changes or derangements of function of the internal viscera. Otherwise, and without some such reference, it seems difficult to understand why there should be structural nervous communication, and thence pain, upon any part of the surface of the body, consequent upon the pathological state of internal viscera or internal parts of the body.

Perhaps one of the most frequent of the "sympathetic" pains is that which occurs between the shoulders, or over the inferior angles of the scapulæ. This pain must be connected with the distribution of some of the spinal nerves, because no other structures could express the pain, and no other nerves occupy that position, except the fourth, fifth, and sixth dorsal nerves, which are distributed over the inferior angles of the scapulæ and interscapular space. Hence we must conclude that these

nerves are the immediate seat of the pain. If we trace internally the great splanchnic nerve from within the thorax downwards, and find it connected at its abdominal end with the solar plexus, thence trace its distribution to the stomach, duodenum, liver, and pancreas; and if we follow the other or upper end of the same great splanchnic upwards to the fourth, fifth, and sixth dorsal nerves, which give peripheral sensitive filaments to the integuments, over the angles of the scapulæ, to the interscapular spaces and the adjoining skin, one can well imagine (without going into the question of how the transmission is made) that these nerves carrying the influence upwards and backwards may explain the occurrence of the pains sometimes experienced in those external parts associated with abdominal visceral disturbance. I think it likely, then, that the pain which persons experience in disease of these viscera may be explained by the relative position of the great splanchnic nerve, communicating, on the one hand, with the solar plexus, and thence with these digestive organs, and, on the other, distributing its branches to the fourth, fifth, and sixth dorsal nerves.

I have detained you with these general, but I hope pertinent, remarks on the subject of pain in anticipation of their more exact application to cases of well-defined disease of the spine. As in accidental injuries to joints, so in accidental injuries to the spine—as in diseases of the joints, so in diseases of the spine—mechanical rest is an essential part of the treatment, and on this account it is to be steadily pursued. And here I must state my belief that the majority of the cases of primary disease of the spine in children, and almost all those in adults, are the results of exercise persevered in after fatigue—that is, after muscular exhaustion, or of accident, unacknowledged or overlooked. This, I think, is opposed to general opinion, which affixes tubercular disease or scrofula to disease of the spine in children as its almost invariable cause. The earlier the detection of spinal disease the more successful will be its treatment by appropriate rest. I trust I shall not be thought too sanguine when I assert it to be my firm conviction that if diseases of the spine were recognized sooner than they usually are (and I am confident they may be), most of the cases would be cured by properly applied rest. If the disorder is allowed to proceed until deformity is manifest, as in hip-joint disease, then assuredly the difficulties of the case are much increased, and the prospect of a favorable result much diminished, though not by any means destroyed.

In the cases of inflamed joint, we can discover its actual condition through the existence of a single local symptom—viz. increase of temperature in the parts. So, in disease of the spine, there is one symptom which almost always stands out most prominently, I would almost say solicits our right appreciation of it, and that is, local and fixed pain upon the surface of the body, with or without exacerbations, local increase of temperature being absent at this spot. I feel quite certain that through the medium of this symptom, properly employed, we may be led to the recognition of morbid conditions of the spine long before there is any evidence of disease by palpable deformity.

Diseases of the spine may begin in the vertebræ or in the intervertebral substance—I think, upon the whole, most frequently in the intervertebral substance, or where this is joined to the vertebra. This rather supports the view that diseases of the spine are very often the result of accident, because we know that in accidents, at least so far as I have been able to discover, the most frequent lesion in injury to the spine is a par-

tial severance of the vertebra from the intervertebral substance; and I suspect the same thing obtains with respect to disease of the spine.* The pain associated with diseased spine to which I now refer is found upon the skin supplied by the nerves which escape from the vertebral canal through the intervertebral foramina, close to the bones or intervertebral substances, either of which, as I have said, may be the seat of the disease. It is upon the recognition and right interpretation of the cause of this pain upon the surface of the body that we ought to place the best prospect of early and correct diagnosis in spinal disease.

In disease of the lower cervical, dorsal, and lumbar regions of the vertebral column, the pain is usually expressed symmetrically—that is, on both sides alike. It is often, however, not so when the disease lies between the occiput and atlas, or between the first and second cervical vertebræ. In all cases of symmetrical pains the cause is central or double, both sides being in a like morbid condition, whatever the disease may be. I have had this sketch (Fig. 13) made for the purpose of reminding you of the method of proceeding in analyzing the cause of symmetrical pains. I will select two of the dorsal nerves for the purpose of illustration.

The positions of the sixth and seventh dorsal nerves are here indicated, as they are distributed to the skin just over the pit of the stomach. If pain be felt at that part alike on both sides of the median line, these nerves become the only possible expression of that cause, for there is no other structure there situated which could manifest the pain. By, then, tracing the nerves producing these surface-pains backwards to the posterior median line, and noting accurately the healthy or unhealthy condition of the various structures near which these intercostal nerves would pass —such as the ribs, pleuræ, aorta, œsophagus, and other structures in the posterior mediastinum,—we arrive at the vertebra and spinal marrow, and in that way, proceeding by the law of exclusion, we arrive at the diseased spine as the real cause of the pains experienced at the pit of the stomach. (See Fig. 13.)

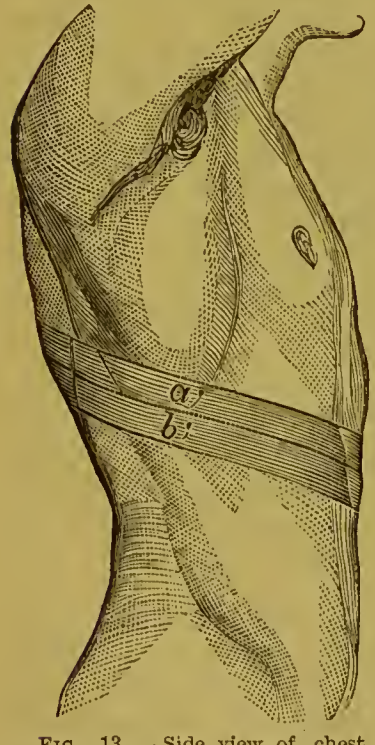


FIG. 13. — Side view of chest, showing the course of the sixth and seventh dorsal nerves.

I would now point to the application of this method in practice, as illustrated by a case which I saw in 1851. On the 18th of March of that year, Mr. Ray, of Dulwich, brought me a boy, eight years of age, who had been suffering from severe pain during January and February, 1851, just above the pit of the stomach, and who used to walk about with his hands placed over that region, with the body a little inclined forwards, as

* This view, that disease of the spine commences at the junction of the vertebræ with the intervertebral substances more frequently than in the intervertebral substances or the vertebræ themselves, receives support from the fact that the junction of a more to a less elastic body is the weakest spot, and therefore receives the full effect of a strain. In a somewhat similar manner, aneurisms so commonly commence at the junction of an atheromatous with the healthy part of an artery; such a spot, with its sudden diminution of elasticity, being naturally unfitted to meet either a strain or increased blood-pressure.—[ED.]

if suffering from some irritation or pain of the abdominal organs, in which direction the treatment had hitherto been chiefly applied, but without much benefit. It was noticed that the pain increased during the maintenance of the erect posture, and that it was relieved by the recumbent position. The child was old enough to express a little of what he felt, and when asked where the pain was, he put both his hands over the stomach, where he had previously complained of pain, and we observed that the pain was expressed on both sides alike. Mr. Ray and myself agreed that it was over the peripheral distribution of the sixth or seventh dorsal nerves. I requested that he should be undressed, so that we might be able to examine his spine. We then found that there was disease, with slight displacement, between the sixth and seventh dorsal vertebræ, and pressure upon these vertebræ produced the pain in front. The child could give us no explanation of the symptoms. No known accident had occurred; but the seat of the pain was strongly marked by his placing both his hands in the position which I have described. The real cause of this patient's symptoms was now apparent, and by putting the boy upon a hair mattress on his back—that is, by giving the spine rest—during four or five months, he got quite well, without any local application to the spine. The improvement began immediately on his lying down, and it was steady and permanent. He only took some cod-liver oil. Since then he has had no return of his symptoms, and is now grown up a healthy lad.

In this case, when we traced the dorsal spinal nerves backwards, or centripetally, we immediately arrived at the cause, and having recognized it, there was no difficulty about the treatment. In March, 1860, Mr. Ray reported to me: He is now seventeen years old, is strong, in good health, has not any deformity, and has not had any recurrence of his former symptoms.

I mention this case for the purpose of showing that lapse of time, and the accidental casualties of life have not induced the reappearance of the disease, and of displaying how much useful information we may obtain in practice by a precise examination of the exact seat of pain under these circumstances.

About two years ago Dr. Addison was requested to see a gentleman's son, who was then at the Westminster School, and who, it was thought, had been suffering from something wrong in his abdomen, for he had pain at the pit of the stomach and occasional vomiting. Observing that the tongue and other circumstances did not indicate much serious disturbance in the neighborhood of the liver, stomach, duodenum, and other parts in that locality, he suggested that there might be something amiss with the spine. I was therefore requested to see the lad with Dr. Addison. I found that he had precisely the same pains (as those observed in Mr. Ray's case to which I have been referring) over the pit of the stomach, and that he was *easy when lying in bed.* We believed we recognized disease of the spine exactly between the sixth and seventh dorsal vertebræ. All the stomach medicines were entirely put aside. He was made to lie down on a bed, sofa, or couch in the drawing-room for two or three months nearly uninterruptedly, and from that time he got perfectly well. No cause could be made out for the disease of the spine, except that as he was a tall, growing lad, it might have been induced by sitting daily too long, without any support to his back, upon a form at the Westminster School. The source of the mischief was here accurately diagnosed by observing the precise position of the pain. There was no evidence of a local inflammatory condition where the pain was expressed. It was clearly a pain dependent

upon a cause *situated remotely* from the point of manifestation. Traeing the pains baekwards, we came to the seat of the disease, and then, by adopting rest as an agent, the boy was ultimately eured.

Some time sinee I saw a gentleman, who was brought to me by a surgeon, complaining of something wrong in his back. I was not told what it was, but was requested to examine him. I asked the patient whether he felt any pain. He said, "Yes, I have pain hereabouts," pointing to the distribution of the fourth and fifth dorsal nerves on the ehest. The pain was on one side only, not symmetrieal, whieh led me to eonclude that the eause was one-sided. Upon traeing the posterior eourse of the fourth dorsal nerve towards the spine, I recognized a distinct aneurismal bruit. This led me to conelude, as a physieian had done before, that the patient was the subjeet of aneurism. I mention this ease, not for the purpose of prolonging, or parading unduly, the subjeet, but merely to show what precision this method of examination gives.

If a patient eomplains of pain on the surface of the body, it must be expressed by the nerve whieh resides there; there is no other strueture that ean express it, and somewhere in the eourse of its distribution between its peripheral termination and its central spinal or cerebral origin the precise cause of the pain expressed on the surface must be situated.

LECTURE V.

Symmetrical Superficial Pains Indicate a Central, or Bilateral and Unilateral Pains a One-Sided, Cause—Cases of Diseased Spine with Symmetrical Abdominal Pains—With Pain on the Back of the Head—Pain over the Left Shoulder and in Left Arm—With Loss of Power and Sensation in the Limbs—With Impending Death from Pressure on Spinal Marrow Cured by Rest—Fatal Cases—Portions of Atlas and Axis Expelled by Post-Pharyngeal Abscess—Anchylosis of both Temporo-Maxillary Articulations—Patient Surviving Fourteen Years after Injury to the Cervical Vertebræ Producing Paralysis of Upper and Lower Extremities.

When referring to the subject of pain, in my previous lecture, I endeavored to show its value as a means of diagnosis, with especial reference to the detection of disease situated remotely from the part where the pain is expressed. I have little doubt that my observations seemed to be rather wide of the ultimate object which I had in view—viz. the consideration of pain in its relation to the diseases of the spine. But I must claim your indulgence when I remind you that part of the object of these lectures is to consider the influence of physiological as well as mechanical rest; therefore, the point which I brought before you, in relation to the fifth nerve, was, I think, within the area of my intention, as an evidence of physiological disturbance leading to remotely situated structural disturbance. I will now, however, confine my observations to the subject of *pain as a local symptom* in its relation to diseases of the spine. In order to carry your attention with me, I will, for the sake of brevity, endeavor to reduce my views to the form of a proposition—a proposition admitting of qualification, it is true, but it may assist your apprehension of my meaning. I would state, then,—

That superficial pains on both sides of the body, which are symmetrical, imply an origin or cause the seat of which is central or bilateral; and that unilateral pain implies a seat of origin which is one-sided, and, as a rule, exists on the same side of the body as the pain.

This is an important stand to take in endeavoring to unravel any obscure case through the medium of local pain. I must therefore repeat, that in cases of symmetrical pains on the surface of the body, without the local manifestation of inflammation by an increased temperature of the parts, the cause must be central; that if the pain be felt on one side only, the cause is only on one side, and it is on the same side of the body as the pain.

Associated with disease in the lower cervical, or the lumbar or dorsal vertebræ, the pains are almost always symmetrical, whilst in diseases between the occiput and atlas, or between the atlas and the second vertebra, it often happens that the pains are unilateral, or one-sided. The probable ground of this peculiarity is, that the disease of the spine which occurs between the occiput and first vertebra, or between the first and second vertebræ, may attack and confine itself to one of the joints between these bones; whilst a disease of the lower cervical and dorsal and

lumbar vertebræ, generally involves the whole of the body of the vertebræ, or the whole of the intervertebral substance.

I detailed in my last lecture two or three cases showing that, notwithstanding the strikingly marked symmetry of these spinal pains on the surface of the body, especially over the abdomen, they were not properly interpreted, and consequently that such cases were often treated erroneously by being thought to depend upon some abdominal disturbance. I will now mention two or three other cases of a similar description. One is very characteristic, and I have the notes of it from the gentleman in attendance. I purposely abstain from mentioning the name or the locality.

Case of Diseased Spine, with Symmetrical Abdominal Pains.

E. A——, aged four years and a half, a moderately robust girl, with a rather strumous diathesis, always enjoyed good health until about a year ago, when she began to lose flesh; her face became anxious, she stooped a little in walking, complained of symmetrical pains in her belly, and soon became fatigued. She was under medical treatment for some time for the abdominal affection without benefit. In consequence of the continuance of these symptoms, she was sent to the sea-side. The surgeon there in attendance assured the parents that she was suffering from a slight stomach derangement, and physicked her accordingly. One month subsequently to this period the child returned home much reduced in strength and flesh, and unable to walk about, from spasmodic pinching pain in the abdomen, which "doubled her up." In a short time, however, having been kept quiet in bed, she recovered her flesh and strength, so as to be enabled to walk about a little without pain. Quickly again all the untoward symptoms supervened; the abdomen became large and tumid, bowels irregular, with pain in the belly, as if a cord were tied round the abdomen. (This sensation of a cord around the abdomen is very significant, and is usually suggestive of spinal mischief. A gentleman whom I saw from the neighborhood of Norwich, with a disease of the spine, in detailing his case to me, said: "Did you ever see any of those Italian fellows, with monkeys on boards, dancing to music, with a cord or piece of leather strapped tight around the belly and loins? That is just how I felt"—giving one an idea of the pinching and contracted condition of the abdomen which he had experienced.) The advice of another surgeon was obtained, who assured the parents that the mesenteric glands were affected. The urine was at that time phosphatic and ammonical. She was allowed to go about as usual. In a short time the alteration and unsteadiness of gait became more marked, and the other symptoms continuing, she was taken to London to see a surgeon (not myself), who told the parents that the child was suffering from angular curvature of the spine. The child was placed in a recumbent position, and I was consulted. I saw this patient on the 19th of March, 1860, when there was evidence of disease of the eighth and ninth dorsal vertebræ, with slight projection backwards. The urine was now healthy. Uninterrupted rest in the recumbent position was ordered, with no medicine at all. It had recently been remembered (this is one of the important points) that the child, about a year ago, fell out of bed upon her back—a distance of about two feet—and that her abdominal symptoms began about three months afterwards. This I take as another illustration of what I have generally found, that almost all these diseases of the spine are the result of slight accidents overlooked. On the 15th of May the child was lying down, and was re-

ported to be in excellent health and spirits, having no outward symptoms. It was then intended that the child should lie down two or three months longer, and we assumed that, if on resuming exercise it was gradual and steady, she would be cured, and cured by rest.

It is apparent that in this case the real cause was altogether overlooked; that the abdominal symptoms were treated as depending on some error in the abdominal viscera, when they merely depended on the spine, and the spinal condition was for a time altogether ignored. I do not mention this case by way of casting imputation on any one. We all improve our professional knowledge by observation and experience, and this is a point of experience.

A little while ago, Mr. Sewell, a surgeon in Lambeth, reminded me of a like case that I had seen with him nine years ago. It was the case of a little girl, six years of age, with symptoms as nearly as possible like those I have just detailed. There was disease in the lower dorsal vertebræ, with slight projection backwards, and psoas abscess fluctuating just below Poupart's ligament. She got perfectly well by six months' rest, and the abscess has never shown itself since. It gradually receded; I presume it has been absorbed. She is now at school, perfectly well in every respect, except a slight vertebral deformity.

I direct your attention to these two or three cases, especially, because in childhood there is oftentimes very great difficulty in detecting the real position of the pain of which such young children complain. When we see an adult, or a person advanced in life, he is able to express the precise position of the pain which he feels, and may, perhaps, be able to indicate the depth of the pain, so as to enable us to get at the real cause.

No cases of diseased spine are so immediately dangerous to life as those in the upper part of the cervical region, especially if situated between the first and second cervical vertebræ. I believe if surgeons will examine carefully the pains of which such patients complain, and use them as a means towards the right interpretation of the probable seat of the real disease, and then adopt, in a most positive and determined manner, the proper treatment by rest, the majority of these cases will do well.

I shall now endeavor to sustain this opinion by detailing some cases.

Disease of the Spine, with Pains on the Back of the Head.

About fourteen years ago I saw, in consultation with the late Dr. Bright, a gentleman, aged twenty-eight, who had been suffering for some time from pain at the back part of his head, which was thought to be rheumatic, and had been treated medically without any benefit. The cause of the pain was the question to be decided. Dr. Bright entertained an opinion that pain at the back of the head resulted sometimes from the close proximity of the vertebral artery to the sub-occipital nerve between the occiput and the atlas, or to the great occipital nerve, between the atlas and axis, and that the pressure of the artery upon one of these nerves produced the pain at the back of the head. This is the chief reason for my mentioning this individual case, because I believe the explanation will not hold good as regards the sub-occipital nerve, for that nerve normally rarely sends any filaments to the skin beyond the muscles; indeed, it is chiefly a motor nerve. The great occipital nerve supplied the skin where the pain was felt by this gentleman (*vide* Fig. 12, *a'*), and on tracing this nerve towards the spine, we came to the cause—viz. disease between the first and second cervical vertebræ. The patient was ulti-

mately cured by continued rest in the nearly horizontal position; the cure, however, consisted in complete anchylosis of the bones, and a fixed neck, with the head turned somewhat downwards and towards the left side. This patient died from pulmonary consumption twelve years after his recovery from his disease of the spine.

Disease of the Spine, with Pain at the Back of the Head and over the Left Shoulder and in Left Arm.

In the autumn of 1857 I was consulted by a lady from one of the Midland Counties, respecting a pain she experienced on the back of her head and ear, and upon the shoulder of the left side, accompanied by loss of power, and pain in her left arm. I was told that these symptoms had come on about Christmas-time of the past year, without any known cause. She had from the first submitted to constant medical treatment, and not improving, had been then sent to Cromer, on the Norfolk coast, to improve her general health, and with the hope of getting rid of these supposed hysterical or rheumatic symptoms. She remained at the sea-side during the whole of the summer without any benefit. When I saw this lady in the autumn of 1857, her age was about thirty; she had pains on the left side, at the back of the head, and at the posterior part of the external ear; pain over the clavicle and shoulder (all on the left side); pain, with loss of power, in the left arm; pain deep in the neck on pressing the head directly downwards upon the spine, and on rotating the head; some fulness and tenderness on pressure about the first, second, and third cervical vertebræ, especially on the left side. She could not take walking exercise in consequence of the increasing severity of all the symptoms. She had almost sleepless nights, and her appetite was very bad. Expecting to learn that she had had some accident, I was particular in my inquiries on that head, but nothing of the kind was admitted by the patient. It was obvious that there existed some disease or injury of the spine affecting the occipital nerves (see Fig. 12, *a'*, *b'*), the third cervical nerves, and the nerves forming the left axillary plexus. As far as I could interpret the case, rest appeared to be the proper remedy. The patient maintained almost uninterruptedly the recumbent position during nearly three months, two sand-bags being placed one on each side of the head. You will excuse my bringing forward these sand-bags, but they are not sufficiently used. They are useful in cases of fracture, for the purpose of sustaining the fractured parts in a right position. They are also extremely useful in the kind of case which I am now detailing, and eminently serviceable in cases of disease of the spine in children, when situated high in the neck. Every practical surgeon knows how difficult it is to keep the neck and head of a child quiet and in the recumbent position, when suffering from disease of the cervical portion of the spine. I know of no simple mechanical means answering this purpose so well as sand-bags, made of bed-tick, and about three-fourths filled with dry sand. One is to be placed on each side, close to the head and neck, so as to be moulded to them, in order to keep the head straight, and to render lateral or rotatory movements impossible. As I have said, two heavy sand-bags were placed, one on each side, upon the pillow, supporting the head of this lady. The only medicine employed was one-sixteenth of a grain of bichloride of mercury twice a day, during about two months. At the expiration of three months the patient had lost all pain and tenderness, and had regained the use of the arm, neither did pressure nor

rotation of the head induce pain. The fulness in the neck had also disappeared.

I might here refer to what I have already alluded to, when speaking of inflammatory effusions, and endeavoring to show that the effusion of lymph, associated with local disease, really acts as a splint to secure local rest to diseased parts, and so aids recovery. In the case now under consideration this is the interpretation of the fulness of the neck during the persistence of the disease, and its disappearance when the original disease was removed. It is the same with disease of the larger joints of the body when a cure is effected with or without anchylosis: all the surrounding lymph that has been poured out for a great length of time, and which seemed to promise to be very enduring, entirely disappears. Its object was to act as a temporary splint, to keep the parts quiet; that duty having been performed, the splint of lymph is no longer required, and it is absorbed, just like the temporary effusion, or callus, in the case of fracture. To conclude the case before us: this lady left town, and afterwards reported herself quite well.

I may here add, that this patient was accompanied by a lady who was very anxious to know whether her friend would get well. There was an intensity in her anxiety which I could not understand; for she really shook with fear when she looked forward to the possibility of death occurring to the patient. The real cause of the patient's symptoms, and of this anxiety, was afterwards explained to me. The disease in the neck was produced by a blow playfully given by this other lady, with a bolster or cushion, upon the left side of the head of the patient, which forcibly displaced it laterally. These two ladies had been reading with each other something about the intestine wars of the houses of York and Lancaster. One seized a red and the other a white rose, and they had a battle of the bolsters instead of the battle of the roses. My patient (the white rose) was struck down, and so York fell—upon the carpet, and was unconscious for some little time. She had, as reported to herself, a sort of struggling fit. On recovery she was put to bed, and in a day or two nothing remained of the accident except some tenderness in the upper part of the neck; but soon afterwards the symptoms already described came on.

This patient had been under treatment nine months, getting worse the whole time. At first I experienced great difficulty in persuading her as to the necessity or advantage of her lying down; but having felt considerable relief to all her painful symptoms in about a fortnight, she then made no further opposition to the adoption of rest to the spine and head by lying down. This patient was certainly perfectly cured, and *rest*, so far as I could interpret it, was the sole important element employed to aid and secure her recovery.

The next case is that of a surgeon, who was in the yacht of another gentleman. Running along from one part of the ship to another (I do not attempt to mention the names of the parts, lest I should make some very ridiculous mistake), he struck his head against the top of a door, and was thrown backwards with great force. Very shortly afterwards he had pain in the distribution of the occipital nerves at the back part of the head and the back of the neck (*vide* Fig. 12 *a'*, *b'*). Six weeks from that time (he still continued in the yacht), having experienced some increasing pain, and heard and felt a grating sensation in his neck, he was somewhat alarmed, and came to me, suffering from pains indicating disease of the second or third cervical vertebra. He was ultimately cured by lying down—that is, by rest. On the 8th of February last he came to me per-

feetly well, and he says he was quite eured by *rest*. Time will not permit me to dwell upon the details of this surgeon's ease, although I have his permission to use his own notes of his symptoms.

The anatomieal diagrams (Figs. 14 and 15) were taken from disseetions made by myself many years ago, and I merely refer to them as they point out the relation of the oeeipital bone, the atlas, and the vertebra dentata, and the various ligaments associated with the upper cervieal vertebræ. These are the strong means employed by Nature to support the head and neek, and at the same time to permit flexion, extension, and rotation of the head.

Disease of the Spine, Pain at the Back of the Head, with loss of Power and Sensation in the Limbs.

On the 28th of February, 1858, I was requested to see Mrs. S——, aged forty-five. I found her sitting in a large, high-backed arm-chair, supported by pillows, with her head resting upon the side of the chair, unable to rise from her seat. I ascertained the following facts from her husband, and partly from herself. Her voice was very feeble, and her breath extremely short. During several months baek, she had been suffering from pains in both arms and weakness of both legs, aecompained by pains in the neek and shoulders. She had been under medical treatment during the whole time, and had consulted a physician and an hospital surgeon. Both, according to the patient's report, considered the case as one of rheumatism or neuralgia, and ordered her to take walking exercise daily: one of them said two hours daily; the other, as much as possible. Iodide of potassium, eolchicum, and opium to relieve the pains, had been freely administered. The pains were really terrific (that was her own description) in the arms at night, generally commencing about twelve, and eontinuing until four in the morning, when she usually dropped off into a short sleep. The dropping off to sleep at any time induced jumpings and startings of the limbs. This is a pretty constant concomitant symptom when the central portion of the spinal marrow is involved in the mischief, that being the very seat of the excito-motory function, as regards the spinal marrow. All her sufferings were increasing in severity and in danger up to the day I saw her sitting in the chair, when she presented the following symptoms: Loss of sensation in both arms, so that the prick of a pin was not felt (this I examined carefully myself). Both arms were nearly paralyzed. She could move her fingers slightly, but could not lift either hand or arm, and was obliged to be fed by her daughter; this condition had been eoming on nearly four months. In both legs sensation was much diminished, and they were imperfectly paralyzed. She could neither walk nor stand, and was therefore carried from place to place. Both the upper and lower extremities were swollen from venous congestion, but not œdematous; this seemed to depend upon the difficulty experienced in her respiration, which interfered with the transmission of the blood from the right to the left side of the heart, and so caused venous congestion in the veins tributary to the venæ cavæ. This, I believe, explained the accumulation of blood observable in the arms and legs, and on the surface of the face, for the latter was swollen and the veins full. The voice had become gradually more and more feeble, and deglutition was difficult—indeed, sometimes so difficult that she was afraid of being choked. She could not move her tongue freely, nor protrude it; hence her articulation was very imperfect. (I think we may fairly infer, from the difficult move-

ments of the tongue, that the hypoglossal nerve, which is attached to the medulla oblongata, must have been implicated in the mischief.) There was no paralysis of the face, no loss of power, no pain, no loss of sensation in the distribution of the fifth nerve. The movements of the eyes were normal. There was exquisite pain and some tenderness at the back of the head, extending to the vertex on both sides of the median line posteriorly (*vide* Fig. 12, *a'*). (This, you see, marks pretty accurately the distribution of the great occipital nerves; therefore, if any pains be expressed in that neighborhood, it must be referred to the great occipital nerves.) There were pains at the back of both ears (within the distribution of the small occipital nerve), but more especially upon the right ear (*vide* Fig. 12, *b'*). There was no pain in front of the ears, or in the external auditory canals. (This is in accordance with the fifth nerve being free from implication.) The head was inclined to fall forwards, and, indeed, she found it impossible to keep it up without artificial support of some kind. On pressing the head directly downwards upon the spine, and attempting to rotate the head upon the spine, she could not bear it. She became nearly pulseless and fainted, and the limbs tremulous and agitated. We immediately placed her upon the floor of the room. I thought she was dead, but she very slowly recovered. The neck, from immediately below the occiput to opposite the first, second, and third cervical vertebræ, was a little swollen and painful on direct pressure. Bowels very much constipated; micturition very difficult and tedious, the urine of a strong, pungent, ammoniacal odor. The patient could not recollect any mischief having occurred to the neck; but she remembered she had frequently experienced pain in the neck and head in trying to take any weighty things from high shelves.

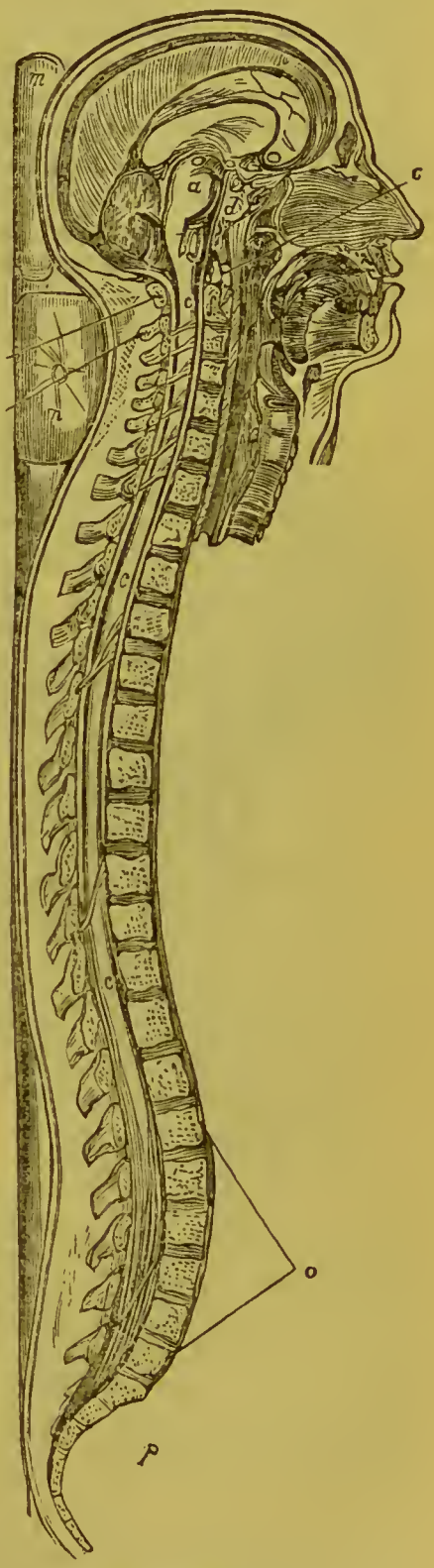


FIG. 14.—Longitudinal section of a head, spine, &c., on right side of the median line. The body recumbent. Those parts of the drawing only are lettered which have reference to the cases of diseased spine which are described in the lecture. *a*, Pons Varolii. *b*, Medulla oblongata. *c*, Spinal marrow, terminating opposite the space between the first and second lumbar vertebræ. *d*, Base of skull formed by occipital and sphenoid bones. *e*, Atlas, or first cervical vertebra. *f*, Axis, or second cervical vertebra, with its ascending or odontoid process interposed between the atlas and the medulla oblongata. *m*, Thin pillow placed under occiput. *n*. Thicker pillow, supporting the hollow of the neck, so as to prevent the second vertebra falling backwards upon the medulla oblongata. *o*, Six lumbar vertebræ, as found in the body dissected. *p*, Sacrum.

I will not detain you with the full details of the case. It is a very important one, not only in regard to its actual character, but as having been overlooked by the physician and surgeon who were first consulted.

Believing the disease in this case to be seated about the first and second cervical vertebræ, that all the symptoms were explicable upon such a supposition, and that the only possible remedy was absolute and long-continued rest to the spine, I directed her to be placed in bed flat upon her back immediately; and I did not leave the house until it was done. A small, firm pillow was put under the neck, and, in the evening of the same day, two large, half-filled bags of sand were placed, one on each side of the head and neck, to prevent any lateral movement of the head. She was not to be disturbed from the horizontal position for any purpose whatever; the bowels were to be relieved by enemata, and the urine to be drawn off if necessary. As the exact and methodical arrangement of a patient suffering from disease of the upper cervical vertebræ is a matter of great importance, I have placed before you a drawing (Fig. 14) of a vertical and nearly median section of the head, brain, spine, and spinal marrow, for the purpose of enabling me to explain and illustrate the necessity of placing the patient in a properly sustained position in bed. The drawing is copied from a recent dissection made for this object.

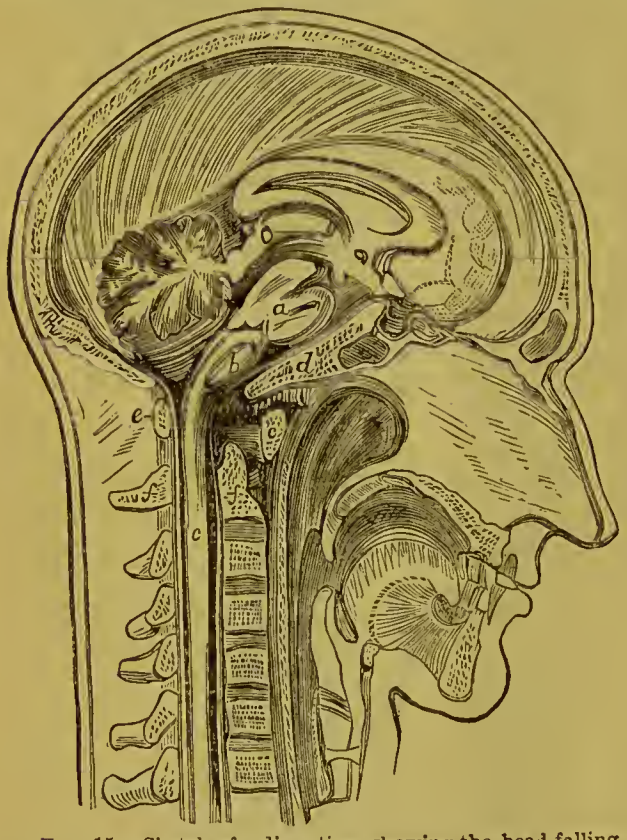


FIG. 15.—Sketch of a dissection, showing the head falling forwards, as happens in some cases of destruction of the ligaments, associated with disease of the joints between the atlas and axis and occipital bones. The head and atlas inclining forwards, and leaving the second vertebra in its proper position, crush the medulla oblongata upon the odontoid process of the second vertebra, and so cause sudden or instant death. *a*, Pons Varolii. *b*, Medulla oblongata. *c*, Spinal marrow. *d*, Base of skull, formed by occipital and sphenoid bones. *e*, Atlas, or first cervical vertebra. *f*, Axis, or second cervical vertebra, with its ascending odontoid process. These bones are here shown widely separated, as the result of the division of the ligaments between them.

The patient was placed with her back flat on her bed. This position brought on extreme difficulty in her breathing. Whilst she was still in the recumbent position, and breathing with difficulty, I placed my hand underneath the neck, and lifted upwards and forwards that part of the spine. The sense of suffocation became at once much diminished (I had observed the same circumstance before, in another patient who had disease of the highest part of the spine), and I had therefore a small, firm pillow put underneath the neck, which supported it very perfectly. This is a very important fact, because I think I have known at least two persons who were destroyed in consequence of this little point not having been attended to.

If the ligaments between the first and second vertebræ and the occipital bone be destroyed, and you have nothing to support the great poste-

rior concave or hollow of the neck, this part of the spine gravitates; the odontoid process sinks or falls, and presses upon the lower part of the medulla oblongata. (See Figs. 14 and 15.) By putting something (say a small firm pillow) underneath the neck, we lift up the body to the second vertebra, and remove the odontoid process from the lower part of the medulla oblongata, and thus prevent the fatal results of pressure upon it.

I have here another sketch, taken from the same dissection as Fig. 14; but in this instance the ligaments between the second vertebra, the atlas, and the occipital bone have been purposely divided, and I believe it fairly represents the condition of the parts which caused the death of one of the patients to whose case I shall presently allude. In the sketch before you all the before-mentioned ligaments have been cut away. If a dead body, thus prepared, be placed in the *recumbent position*, without mechanical support to the hollow of the neck, the second vertebra, with its odontoid process, falls towards the medulla oblongata, and makes pressure upon it; or if a dead body, so prepared, be placed in the sitting or erect posture, the head has an immediate tendency to fall forwards, and to impale the medulla oblongata upon the odontoid process, which, as you may see, strikes exactly upon the medulla oblongata. This is the mortal part of the cerebro-spinal axis, because it superintends the respiratory process; and thus it happens that patients so circumstanced are killed immediately.

In the patient's case, to the details of which I have been directing your attention, a small pillow was placed under the cervical portion of the spine, by which we were enabled to lift up the odontoid process away from the medulla oblongata, and maintain the latter in a state of comparative security from pressure. I repeat that when this patient was lying flat upon the bed, she could scarcely breathe, but as soon as I put my hand behind the neck and lifted up the odontoid process, she was nearly free from dyspnœa. It was obvious that her condition necessitated her lying down upon her back for some considerable time.

This patient was ordered one-sixteenth of a grain of bichloride of mercury, and one drachm of tincture of bark, to be taken twice or thrice daily in a wineglassful of water, and sufficient laudanum, when required, to procure sleep. At the expiration of a month she had regained her voice and her power of articulation and deglutition; her pains were lessened, she could sleep more, and all the other symptoms, with her general health, were slightly improved, but not much so. She had found the sand-bags very comfortable; their lateral support to the head and neck appeared to give her confidence, especially in going to sleep. She remained lying down, and in the same position, almost without stirring, during seventeen weeks, uninterruptedly. At the expiration of that time, all her symptoms were so much relieved, that it was thought safe to allow her to be raised a little in bed, more and more, but by slow degrees, every two or three days for about ten minutes, with the head supported. About two months afterwards, she was permitted to sit for a short time in a chair, but still with the head supported. She had now regained her power over her limbs, was nearly free from numbness, and had little or no pain on moving the head. Walking exercise, to be carefully and gradually increased, was therefore allowed. After some little time, gaining strength and confidence in herself, she extended her walk into her garden, and remained in it until she became so fatigued and exhausted that she lost all muscular power, and was obliged to be carried in-doors. The pain in the neck and back of the head, and the other old symptoms, again manifested themselves slightly. She then determined that she would not go out of

doors during the next five months. I did not advise it, but she said she would lie down more or less during the whole winter, and get up with the spring of the year. During the winter she was loosely and warmly dressed, got up daily, but spent most of her time recumbent upon the bed or sofa, with her quiet, comforting companions, the sand-bags, relying on the influence of rest for her recovery, which was slowly but progressively accomplished.

I saw this patient myself on the 2d of March, 1860. She told me she had been well during many months, and occupied, as usual, in her household duties. She rides in omnibuses, walks well, and has nothing to complain of except some little weakness and stiffness in her neck, for which she is to wear an iron collar.

Here is a case which puts *rest* in a very triumphant position. I think we may say that the life of this patient was saved by opportune rest. Her early painful symptoms at the back part of the head were not appreciated or regarded in their proper diagnostic light. Had these pains been recognized, and rightly interpreted, by those whom she consulted at an earlier period of her disease, the imminent danger to the life of this patient might have been averted, and much of the delay, associated with her continued lying down, avoided.

And here I am reminded of a contrivance adopted by a patient of mine living in the country, and suffering from disease of the spine, which compelled him to be on his back during many months. He ultimately got well, and is now fully occupied in business. The ceiling of his capacious and comfortable room was, as usual, white. I had occasion to see him in a few weeks after his first lying down, and on entering his room I was surprised to observe the ceiling covered with green gauze. I asked what was the matter, and he said, "The fact is, lying on my back, and looking at the white ceiling all day long, became so distressing and irksome to my eyes and brain, that I could bear it no longer. I knew, from experience, that I could look upon a green field all day long without tiring, and therefore I have had the ceiling covered with green gauze, and since then I have had no difficulty at all." This was a slight practical hint which I thought worth recording.

Case of Diseased Spine, with severe Pain upon the Back of the Head; impending Death from Pressure upon the Spinal Marrow; cured.

I must now briefly refer to the particulars of another case somewhat like the foregoing. In 1850 I was requested by Dr. Addison to see with him one of his hospital patients, a young woman suffering from injury to the upper part of the spine, the result probably of accident. This was subsequently ascertained to be the fact. I found her almost pulseless, with great distress in breathing, loss of voice, an inability to swallow, and nearly complete paralysis of the arms and legs. She had had from the early part of her illness severe pains spread over the back of her head and neck, increased on pressing the head downwards upon the spine, and on rotating it upon the spine. Her symptoms had gradually arrived at this stage of danger without benefit from medical treatment. I might here say, that the difficulty of breathing and deglutition had so greatly increased of late, that it was thought necessary, or to her advantage, to lift her up more and more in the bed; but the change of posture seemed only to add to her distress in breathing and swallowing. These were the difficulties for which my assistance was requested. She was then propped up

in bed by pillows at her back, with her head inclined somewhat forward, or dropping upon the chest. As the impediment to swallowing was almost an insurmountable difficulty, I was desired to examine the throat, but I could not discover anything wrong in it. It was our opinion that her life was in imminent or perhaps instant danger: she was paralyzed, and could not swallow; her voice was excessively feeble, and the pulse not very perceptible; she scarcely breathed at all, and was not quite conscious. It was evident that something must be done without delay. Believing that her symptoms resulted from the odontoid process of the second vertebra pressing upon the spinal marrow, close to the medulla oblongata, I advised that she should be made to lie down immediately. On saying to her, "You must lie down in bed," she replied, in the smallest possible voice, "Then I shall certainly be killed; I can't get my breath." Seeing there was no time for contention, I told her our opinion was, that if not placed horizontally in bed she would in all probability die in a very few minutes. Being paralyzed, or nearly so, she could offer no resistance to my purpose; and I shall never forget the weight of the responsibility when I took hold of her, desired the pillows to be removed from her back, and, supporting her head and shoulders in my arms, slowly placed her upon her back, nearly flat upon the bed, with her head upon a thin pillow, some additional support to the hollow of the neck, and two sand-bags, one on each side of the head, to prevent lateral or rolling motion.

Here was a patient in the greatest possible danger, and I do not hesitate to express the opinion, that if the head had fallen forward, say half an inch, she would have died in an instant. Her sense of suffocation was soon relieved by the horizontal position, and she remained lying down during six months uninterruptedly, at the end of which time all the serious symptoms had disappeared. She was then allowed to move about the ward with caution, and a few months afterwards left the hospital, well, with the exception of a stiff neck, most probably depending on anchylosis or bony union between the atlas and the axis. In this case nothing but complete rest was employed as a remedy ; rest was the only element of success in the treatment, and I think it is a very striking example of its power to prolong life, by enabling Nature to repair her injuries undisturbed.

Case of Diseased Spine, with severe Pain upon the Back of the Head; sudden Death of the Patient.

I will now direct your attention to another case of diseased cervical vertebræ, which terminated in sudden death. It is that of a little child, five years and five months old, seen by me in 1841. She was a small, delicate, unhealthy girl. She had been accustomed to ride a good deal in the country with her mother in an open carriage, and was thought in that way to have caught a cold in the back of the neck, which became gradually stiff and swollen, accompanied by pains in the head and neck. These pains were believed to be rheumatic, and the treatment employed had reference only to that impression, which was supposed to be supported by some pain experienced in the limbs, with cramps and stiffness in walking. She frequently suffered from fever and loss of appetite, and had been under medical treatment during many weeks, the symptoms slowly increasing in severity. The mother told me afterwards that she had thought her an obstinate child, and that she sometimes threatened to punish or to shake her well, because she would not take her food. I have

no doubt if she had done so she would have killed the child. Upon careful examination, I thought I made out the case to be one of disease between the first and second cervical vertebræ, or thereabouts. I say thereabouts, because the parts were too much swollen and too painful to admit of a more accurate local investigation. There was pain at the back part of the head, in the course of the great occipital nerve; pain behind the ear, in the course of the great auricular, and of the small occipital; pain in the higher part of the neck, on rotation of the vertebræ upon each other; and pain in the same vertebræ, probably the first, second, and third, by pressing the bones upon each other. She had some difficulty in deglutition, and the voice had lately changed its character and become more feeble, indicating that the pneumogastric nerves, and possibly the spinal accessory, were involved in the mischief. Thus having, in common with the surgeon in attendance, recognized the real nature of the case, directions were given that the child should be placed upon her back, with her head resting upon a thin pillow, and some additional support to the nape of the neck, each side of the head to be supported by sand-bags, so as to prevent any lateral or rotary movement in the neck. It was plain that if the life of the child was to be prolonged or saved, it could only be accomplished by long-continued rest to the spine: and for the purpose of securing easy rest to the little patient, a water-bed was sent from London, and the child was safely placed upon it, with the sand-bags extending from the shoulders to beyond the head. In about a fortnight, the nurse specially appointed to attend the child, finding that her rest at night was now so calm and quiet, that she was so free from pain and fever, that her appetite and power of swallowing were so much improved, as well as her temper, and thinking she was altogether so much better, and willing no doubt to mark her own penetration, as well as to please the mother by telling her in the morning what had been done by her little charge—this meddling and officious woman, instead of giving the child her breakfast, as usual, without disturbing her head or neck in the least degree, desired the child to sit up to breakfast. The child did so: the head fell forwards, and she was dead. The post-mortem examination proved that disease existed in the articulations between the first and second cervical vertebræ, that the bones were loose, and that when the head with the atlas fell forward, pressure had been made upon the spinal marrow close to and below the medulla oblongata, at the point of decussation, so that the child was killed almost instantly, as in pithing animals. This was a case in which both the surgeon and Nature were completely thwarted. The local disease was considered at the time to be dependent upon a constitutional or scrofulous cause, but I have since understood that it was the result of a blow given to the little girl by her brother, who struck her with something he had picked up in the room. It was not constitutional; there was no visceral disease of any kind.

I thought I might detail this as another case in evidence of a very severe condition of disease, the real character of which had been overlooked, and which in all probability would have been improved and cured by proper and long-continued rest. But, as I observed before, Nature and the surgeon were both thwarted.

Case of Diseased Spine; sudden Death of the Patient.

I have here a preparation from Guy's Museum, which has no special history attached to it. It marks the great features of the cause of the fatal accident which happened in the previous case. There is disease between the occiput and the atlas, and also between the atlas and the axis; the transverse ligament has been forcibly ruptured, or has given way by structural disintegration, so that the odontoid process was free and able to make pressure upon the medulla oblongata, and thus to kill the patient. The late Mr. Mackmurdo informed me, that when attending the surgical lectures of Sir Astley Cooper, he well remembers seeing a preparation exactly like this, to which Sir Astley appended the facts, that the man to whom it had belonged had been long the subject of syphilis, had suffered great pain in the neck, and that, after eating his dinner, his head fell forwards upon the table, and he died instantly. He added that the cause of death was pressure made by the odontoid process of the axis upon the spinal marrow.

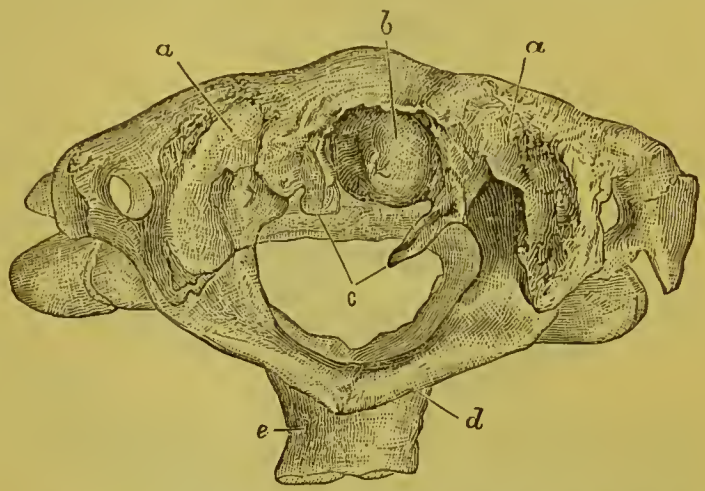


FIG. 16.—Drawing of a wet preparation of the first and second cervical vertebræ in Guy's Hospital Museum, showing partial ulceration of the articular cartilage upon the occipital articulations of the atlas, and laceration of the transverse ligament, which ought to embrace closely the posterior surface of the odontoid process of the axis. *a*, *a*, Upper articular surfaces of the atlas—the disease more advanced upon the right side than upon the left. *b*, Odontoid process of axis. *c*, Ruptured transverse ligament, allowing the atlas with the head to move forward from the axis. *d*, Neural arch of atlas. *e*, Spinous process of axis.

Case of Diseased Spine, with Post-pharyngeal Abscess, from which were expelled portions of the Atlas and Axis.

Here (Fig. 17) is another interesting preparation, consisting of two portions of bone: the larger one appears to be the articular surface of the anterior part of the atlas, which articulates with the anterior surface of the odontoid process of the axis; the other portion, a part of the articular surface probably of the odontoid process. I will now read to you a short record of this case from the Guy's Museum Book:—

"Mrs. G——, a patient of Mr. Babington in 1834, a married woman, who had worked hard at washing, and been much exposed to cold. Five years before, she had an attack of pleurisy, but was not aware of having taken mercury, at least not to salivation, and she never had syphilis. Four months previously to her seeking advice, she began to find her neck stiff, with a pain at the back of her head. These symptoms increased, until one day, on coughing, she brought from her mouth a piece of bone, and subsequently some smaller fragments, and a portion of the atlas, or first vertebra, seen in the specimen. She was visited for some months afterwards, when the head was nearly fixed, and there was a discharging ulcer at the back of the pharynx. The patient was last seen in October,

1838, when she was in tolerable health, and serving at the bar of a public house."

There are in the anatomical museums of this metropolis many pathological specimens of complete bony anchylosis of the occipital bone, atlas, and axis. Such preparations show clearly that very important and dangerous disease of the articulations between these bones must have existed, and that the patients must have lived some long time after the disease had been so far remedied by anchylosis. I have here upon the table before me several preparations illustrative of perfect recovery from disease of this upper part of the spine by bony anchylosis, but I select for your attention this example, partly because the local repair of the spine was only in progress at the time of death, but especially from its displaying also a rare pathological fact—viz., perfect union between the inferior maxilla and temporal bones on *both sides*.

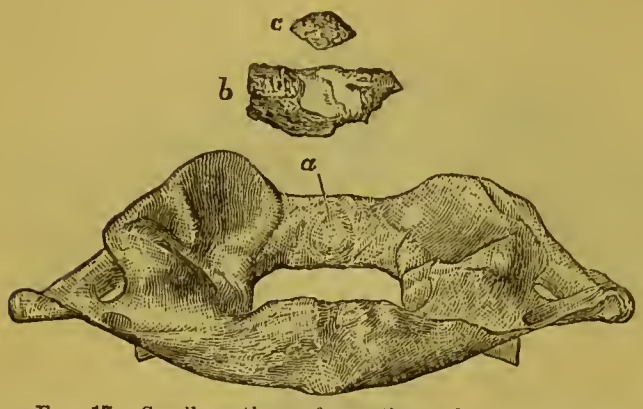


FIG. 17.—Small portions of an atlas and axis which came from an abscess in the pharynx, preserved in Guy's Museum. An atlas is introduced for the purpose of comparison—*a*. The normal articular surface upon the atlas, for the odontoid process, with—*b*, Portion of bone from the abscess, believed to be this same articular surface. *c*, Another portion of bone from the same abscess, believed to have been detached from the odontoid process.

Case of Diseased Spine; Death; Anchylosis of both Temporo-maxillary Articulations.

This head and spine belonged to Charles Davis, a black from Jamaica. He was admitted into Guy's Hospital, October 12th, 1825, under Dr. Bright. Three years previously he slipped down three or four steps into the cabin of a sloop, and in the fall a fork penetrated to a very small depth into the back of his neck. He felt no inconvenience afterwards. Sixteen months before admission he complained of pain in various parts of his limbs, and frequent inability to move his arms and legs freely. "The head is always bent forwards, so that the chin approaches the top of the sternum. He can nod his head a little, but cannot turn it. December 6th.—More pain in the shoulder and neck. 22d.—Was seized with stiffness and pain in his feet. 29th.—Pain in his neck increases; he is unable to walk, and almost to use his arms. He has occasional cramp in his legs; says he fails in every part of his body. January 2d.—Speaks less distinctly; has pain about the muscles of the neck and shoulders, and is scarcely able to walk. 6th.—Complains of pain in the hips on motion. 20th.—Tenderness about the neck and shoulders, increased on pressure; no loss of sensation in any part; bowels regular; urine natural; pulse 100, rather weak. March 4th.—Only very slight motion in the jaw. 7th.—Increasing fixity of the lower jaw. His inability to move the jaw continued to increase, until it became totally locked, so that he could take no nourishment but what he sucked in between his teeth, or through the space produced by the removal of his first molar tooth." He gradually sank, and died March 23d, 1826, about three years after the punctured wound in the neck, which might or might not have been the start-

ing point of the disease in the cervical vertebræ. The post-mortem examination was as follows: "Body emaciated and rigid; neck immovable; the jaws inseparably locked; cranium remarkably thick; arachnoid opaque and thickened; a more than natural quantity of fluid external to the brain, which was generally firm and of healthy appearance. The medulla oblongata was less tough than usual, and broke off short when the brain was being removed from the cranium. The membranes adhered to this part with remarkable firmness. There was no motion between the occipital bone and the atlas; the articulating surfaces had ulcerated, and bony union had commenced. The articular surfaces between the transverse processes of the atlas and axis did not appear to be diseased, but there was a considerable quantity of bony matter thrown out on the dentiform process of the sec ond vertebra, not merely impeding the motion of the joint, but encroaching on the spinal canal. Anchylosis had also taken place between some of the succeeding cervical vertebræ. A very compact and hard bony deposit was formed immediately under the anterior ligament of the spine, upon the bodies of the upper cervical vertebræ, and at that part concealed the intervertebral substance. On cutting the muscles of the temporo-maxillary articulation, it became obvious that bony union or anchylosis of the joint had occurred to a considerable extent on both sides; the soft parts did not appear to be at all diseased in the neighborhood of any of the affected joints."

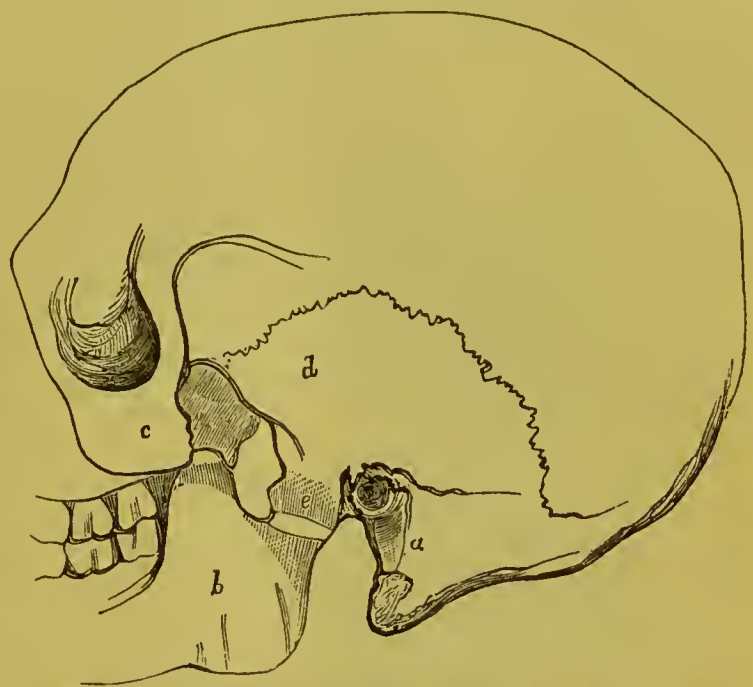


FIG. 18.—Side view of the skull of C. Davis. *a*, Mastoid process of left temporal bone. *b*, Lower jaw. *c*, Malar bone—the zygomatic arch cut away. *d*, Temporal fossa. *e*, Bones forming the temporo-maxillary articulation, cut vertically so as to display their perfect ossific union.

Case of Injury to fifth, sixth, and seventh Cervical Vertebræ; Paralysis and Loss of Sensation in the Upper and Lower Extremities; the Patient lived fourteen years, and then died from another accident.

In two or three respects the following case is one of great interest. John Carter, aged twenty-one, had an injury to the fifth, sixth, and seventh cervical vertebræ, producing paralysis of both legs and both arms. He lived fourteen years, and then died from the effects of another accident. The particulars of this case, so far as I know them, are these: The accident occurred in May, 1836. The man's age was twenty-one. He fell from a tree, forty feet, upon his back, or probably his head. He was senseless, unconscious, and paralyzed below his neck. Being carried home upon a hurdle, the late Mr. Whitmore, of Coggeshall, Essex, saw

him two hours after the accident, and wrote me this note some years ago:—

"It was in May, 1836, that I was called up, on a Sunday morning, between four and five o'clock, to John Carter, who had fallen from a tree, when in the pursuit of young rooks. When I saw him he was perfectly insensible and motionless; cold, and breathing imperfectly; with a pulse weak in the extreme; and he appeared to have sustained some fatal injury to the brain or spinal column, from which there was scarcely a hope of his recovery. The accident had then occurred about two hours, I believe. I ordered hot flannels and other means to be used, to restore warmth to the body and to bring about reaction. In the course of the day reaction was established, and there were signs of returning consciousness, evidenced by a groan when aroused. Towards evening the pulse was so far re-established as to warrant venesection. In the course of the night he became more conscious, and was sufficiently sensible next day to enable me to ascertain that the serious injury was high up in the spine. There was a perfect absence of muscular power, and of sensibility of the skin throughout the body, except in the head and upper part of the neck. The muscular power of the neck was lost also for several days; but after cupping the back of the neck, and using proper remedies, a capability of moving the head gradually returned. The bladder was paralyzed and the catheter required.

"There was no appearance externally to indicate the precise situation of the injury as to the vertebræ—not the slightest irregularity; but the general symptoms and circumstances rendered it pretty certain that serious damage had been sustained by the fifth or sixth cervical vertebra. After some weeks, a certain amount of motion was restored to the head and neck, and sensibility to the same extent; but the rest of the body (as long as I attended the case) remained perfectly paralyzed and insensible.

"I left Coggeshall to go on the Continent, and after five years' absence, on my return I was surprised to find the patient Carter still living, and in much the same condition as when I left England."

This patient used to amuse himself or earn his living by making copies of engravings with his mouth. I have one in my possession, taken from a line engraving of Hewson, in the Sydenham Society's works, which is certainly a most extraordinary example of the man's wonderful artistic capabilities. He employed a camel's-hair brush, three or four inches in length; with which every line was made with the greatest accuracy and precision.

I saw this man several times during the latter period of his life, and took these few notes of his case:—

"Perfect loss of sensation in the lower and upper extremities, except indistinct sensibility on the left side as far as the elbow. Muscles of the left shoulder more developed than the right. Feels distinctly on the left shoulder, and indistinctly on the right shoulder. The left forearm is now flexed; the thumb is turned into the palm of the hand, and the fingers are bent over it. Right arm nearly straight; the little and fourth fingers flexed. The hands remained open until about six months after the accident, when contraction commenced. No contraction in the feet, except that the right foot is a little flexed. Legs jump a little during the efforts at defecation, and sometimes suddenly without obvious cause. Arms jump, especially the right, during micturition. Bowels not open without medicine (senna). On some days has peculiar sensations of chilliness, becomes pale, and then feels hot and flushed during defecation and micturi-

rition. The more constipated the bowels, the more these peculiar sensations are experienced. Urine very offensive when he has caught cold; at other times not so offensive, but always a little so. Urine acid. Feels a distinct pain in the bowels occasionally, and now and then an aching in the loins. When sick, vomits with great difficulty. Erections of penis are frequent, and last a quarter of an hour, with slight escape of seminal fluid occasionally. Spine: nothing abnormal to be felt. No costal movements during respiration; no hiccough. One good meal of meat daily."

This case forms a great encouragement to give every possible care and attention to the treatment of injuries of the spine, with the hope of obtaining the same happy result as occurred in this instance. According to statistics and the text-books, he ought to have died within a few days after the accident; but, repudiating any such duty, he lived during fourteen years, and then his death occurred from accident. Whilst being dragged about in a little four-wheel cart by a boy, he was upset, and, as he could not put out his hands to save himself, he fell with great violence upon the ground; this led to some chest affection, which occasioned his death in a few days. His friends would not allow his surgeon, Mr. Nott, of Coggeshall, to examine the body, and only upon a very special application, just before the removal of the body from the house for the purpose of immediate interment, was he permitted to take out the portion of spine of which a drawing is given in Fig. 19, otherwise we should never have known what kind of accident this patient had experienced.

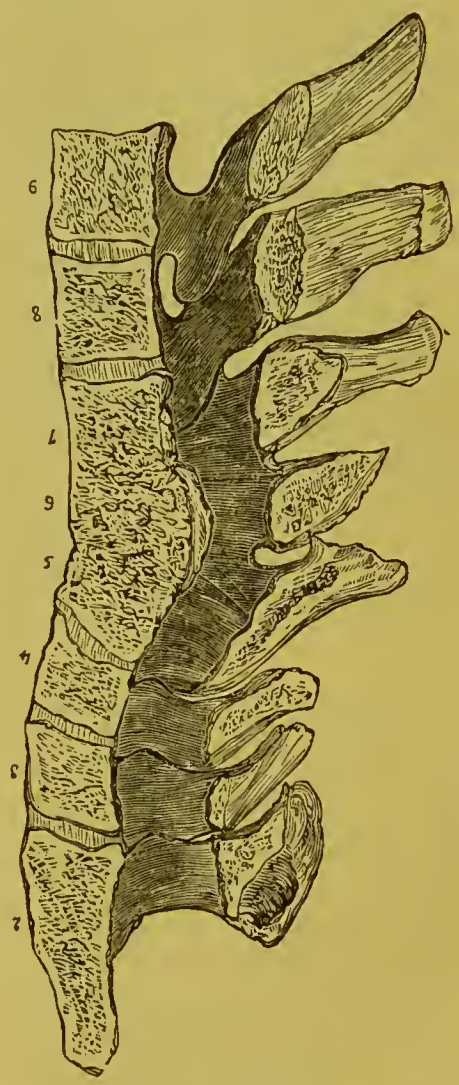


FIG. 19.—Represents a vertical section of J. Carter's spine, including the six *lower* cervical vertebræ and the first and second dorsal vertebræ, marked 8 and 9. The fifth, sixth, and seventh cervical vertebræ are seen consolidated by bone, both at their bodies and their arches.

In the drawing, which was made from the preparation itself, the bodies and arches of the fifth, sixth, and seventh cervical vertebræ are seen blended together by bone. The body of the sixth vertebra is displaced, and projects backwards into the vertebral canal, and no doubt was the cause of the paralysis. It is worthy of notice that the intervertebral substances have disappeared, but their outlines are still marked, and their places occupied by bone. The thin articular laminæ of bone usually interposed between the intervertebral substances and the bodies of the vertebræ are still visible, although the intervertebral substance itself is gone. Every one must admire the perfect and level union by new bone which has taken place at the fore-part of the spine; and if Nature could have been as effective with the spinal cord, this patient might have perfectly recovered. I will conclude my reference to this case by reading an extract from a short memoir of this

man, published by John Parker, in the Strand. I may add that the whole memoir is of great interest, and will amply repay the reader for the time he may employ in its perusal:—

"The way in which John Carter executed his works must be stated. The posture in which he drew was, lying a little on the side, with the head a little raised by pillows. A small, light desk of deal, made under his own directions, was adjusted for him. On this desk his drawing-paper was fastened in the usual way. The drawing to be copied, if of moderate size, was set up between the drawing-paper and the desk; or, if too large for this, was suspended by tapes from the top of the bed. He never drew but in bed. He first sketched his subject with a lead pencil, sometimes as little as four inches in length, which he held between his teeth. This done, a little saucer of Indian ink was prepared, and the brush was moistened by his attendant, and placed in his mouth. He held it fast between his teeth, and by the motion of the head produced most accurate and delicate strokes."

I must apologize for detaining you so long with the details of these cases of disease of the cervical portion of the spine, but they appeared to me of great interest in demonstrating the value of rest as a remedial agent in such diseases. The last case, in which the injury was not situated in the immediate neighborhood of the atlas and occiput, had intrinsic and rare merits of its own, which must be my excuse for devoting so much time to it.

LECTURE VI.

Abscesses Opened to Secure Coaptation to their Internal Surfaces, and to Permit their Union by giving them Rest—Principle Exemplified in Sub-Mammary, Knee-joint, Axillary, Orbital, Cervical, Post-Pharyngeal, Iliac, Sub-Gluteal, Sub-Fascial, and Sub-Muscular Abscesses, together with the best Method of Opening an Abscess—Sinuses Cured by Rest—Treatment of Sub-Occipital, Cervical, Carbuncular, Popliteal, and Facial Sinuses—Cause and Treatment of Irritable Ulcers.

Believing that even in public lectures some little variety may add a slight degree of charm, I have taken the liberty to break in upon the order of my subject, and to ask you for the present to divert your attention from the consideration of pain, as associated with disease of the spine.

As I contemplate the subject of *rest* in its curative aspects, its application appears to me so widely extensive, and the variety of conditions in which we may derive important assistance from its use so great, that I am inclined to say there are few surgical diseases to which it may not be made to contribute relief. My present object, however, is to remind you of its beneficial influence in some of those familiar cases of diseases which the surgeon meets with so frequently in practice. I have therefore selected for our consideration in this lecture its agency in the cure of abscesses, sinuses, and certain forms of ulcer.

I would now put the question—Why do surgeons open abscesses? Various answers may be given: to relieve patients from pain and constitutional disturbance; to prevent the abscess enlarging, or to limit the destruction of tissues; to prevent further encroachment upon important organs; to remove the accumulated extraneous fluid, &c. This is all true; but still the question presents itself—What is the ulterior object in opening an abscess? The ulterior object is to permit and to secure coaptation of the internal surfaces of the abscess—to give its internal surfaces rest, so as to permit of their union, and further rest, for the purpose of consolidating the medium of union. This ulterior object has, or ought to have, an important bearing upon the surgeon's proceedings in opening an abscess. In order to empty an abscess of its pus, we must make the opening into it at its lowest part, just as if we desired to empty a pail of its water, without disturbing the pail, we should make a hole at the bottom of it; or as if we desired to remove the whole of the fluid contents of a soft bladder, and induce collapse of its pliant walls, the aperture of exit must be made at the lowest part of the bladder. In the treatment of abscess, it must be borne in mind, that it is only by the evacuation of the whole of the fluid of an abscess that we can render coaptation of the two surfaces of its walls possible.

It is worthy of remark, that an abscess, under many circumstances, experiences a great difficulty in getting rid of its purulent contents. We see what a great length of time an abscess requires to push out any solid extraneous body, such as a portion of wood or clothing, or of necrosed bone; or a wound to rid itself of a portion of linen thrust into it. A con-

siderable time may elapse before the granulations can extrude these solid bodies. But in the case of a simple abscess the collection of fluid naturally sinks to the bottom, and compels the abscess so to fill up its floor by the tardy process of new growth or slow adhesion, as to eject the fluid against gravitation. The granulations, or newly organized lymph, may ultimately succeed in forcing the fluid contents out of the abscess, but it is a long time before the two surfaces can be brought into accurate apposition, and in general the abscess is a very long time healing. Abscesses, then, ought to be opened at their most depending or lowest part. It is the only way to promote surface coaptation; and it is the first step towards cure. It is also the best preventive against the necessity for daily squeezing an abscess for the purpose of emptying it. This continuous interference with Nature by the surgeon or patient might fairly be called very "meddlesome surgery." There cannot be a doubt that by rubbing the two surfaces of an abscess together once or twice a day, we are not only likely to disturb the natural process of adhesion or granulation, but almost sure by such friction to induce an inflammatory condition in structures which, for the purpose of repair, ought to be in a comparatively healthy state, and quietly taking their own steps towards filling up the whole interior of the abscess in a sound manner.

The lowest part of the abscess necessarily depends on the position of the patient. Thus, in the case of a patient in bed having a sub-fascial abscess of the thigh, the lowest part of the abscess may be the upper part of the thigh.

I may remind you that, in a case of suppuration under the temporal aponeurosis, we sometimes experience great difficulty in curing it. This difficulty arises partly from the necessary movement of the surrounding structures (temporal muscles especially), and from our inability to reach the floor of the abscess. We know that if we open this abscess above the zygomatic arch, whilst the floor of it extends much lower down, the abscess is extremely tedious in closing, and the surgeon fails in his object. By-and-by, Nature herself makes a hole by ulceration into the mouth, at the lowest point of the abscess, near the coronoid process of the lower jaw, and then the abscess or sinus closes. Such a case clearly marks the difficulty in which the surgeon is placed. Under these circumstances, and in such a case, it is better for the surgeon (instead of allowing Nature to be the sole agent in accomplishing the object in view) to pass his probe downwards, through the aperture made above the zygomatic arch, towards the mouth, to feel the end of the probe through the walls of the mouth, and then make a small aperture opposite the point of the probe, and in that way obtain an outlet at the bottom of the abscess. Surface coaptation, equivalent to rest, then quickly takes place, and the abscess, instead of being tedious, is brought by "rest" to a rather speedy termination.

Sub-Mammary Abscess.

In marked illustration of the advantage of this principle, I may mention a case detailed to me by Mr. Luke. It was that of a very large abscess, which he was called upon some years ago to treat, and cured speedily by acting upon these views of opening the abscess at its lowest part, and securing subsequent surface coaptation of its walls.

The patient had a very large abscess, extending under both mammæ across the front of the chest, from which Mr. Luke let out the whole of its contents—more than three pints of pus. He took care to open the

lowest part of this abscess, and to coapt the dome and floor of the abscess by pressure with pads of lint, plaster, and bandages. The result of this accurate coaptation was that the abscess was completely cured in a few days.

This patient was thus cured by giving "rest" to the walls of the abscess, and enabling them to become united and consolidated by adhesion. This case expresses an important fact, for there can hardly be a doubt that, if this large abscess had been opened at the upper part, and the pus incompletely evacuated, it would have required a very long time on the part of Nature to extrude the fluid. We have here, then, a good example, showing on a large scale the advantage of opening an abscess at its lowest point,—the interpretation of the successful result being that of accurate coaptation and rest." *

Abscess over the Knee-joint.

I have had this diagram (Fig. 20) made for the purpose of illustrating the position of one kind of abscess which occurs in the neighborhood of the patella. I have seen two or three such cases, where an abscess upon the exterior of the knee-joint has ultimately found its way into the interior of the articulation. In this sketch from nature I have endeavored to indicate the position of an abscess underneath a layer of fascia lata which is prolonged over the patella. Such an abscess may be the result of an

* To show the value of the treatment of abscesses by rest, the two following cases have been added, the one treated by mechanical, the other by physiological, rest. The first, for which I am indebted to the kindness of Mr. Cooper Forster, is of especial interest on account of the previous prolonged and ineffective treatment. The notes of this case are from the report of the ward-clerk, Mr. Plummer.

W. S., æt. 30, was admitted into Luke ward under the care of Mr. C. Forster, Dec. 6, 1875. About eighteen months ago he noticed a slight swelling on the upper part of the right chest. This proved to be a subpectoral abscess, which "came to a head and broke" Nov., 1874. As the place continued to discharge occasionally, he was under the care of his club doctor till June, 1875, when he went to University College Hospital. Here the swelling was "lanced" three times, and poulticed. He left in September, and attended as an out-patient for a month longer, and then was under his club doctor again till his admission into Guy's in December, 1875. On admission there was an abscess over the second right rib. No dead bone could be detected after laying the abscess freely open. Dec. 13.—The arm was fixed with bandages, so as to keep the pectorales quiet. Jan. 31.—The arm has been kept fixed; the place is almost entirely healed, discharge very slight, the skin around the wound is now firm and healthy. Mar. 3.—No discharge. Mar. 23.—The patient went out cured.

The details of the second case, in which physiological rest was successfully used, have been given me by Mr. Hilton, in whose practice the case occurred.

In 1864 Mr. Hilton was consulted by a lady who had a large abscess in her right breast soon after a confinement. The abscess had continued to discharge from several sinuses during many weeks, notwithstanding the application of well-adjusted pressure and many other local means. All along since her confinement the patient had continued to suckle the child from the left breast, the supply from which seemed sufficient for it. Mr. Hilton, finding on inquiry of the patient that the breasts sympathized physiologically both before and during the feeding of the child, advised that this functional and associated sympathy should be destroyed by weaning the child, in order to secure physiological rest to the right breast. The ordinary means were adopted, and within a day or two the right breast lessened both in size and hardness, and the discharge from the sinuses quickly ceased. In a few days the local abscess symptoms disappeared, and secretion of milk in the left breast soon ceased after the withdrawal of the child. Since the above date this lady has had several children, and has experienced no arrest of function in the right breast. In April, 1876, Mr. Hilton had an opportunity of examining the right breast, and found it presenting the condition normal to this organ in pregnancy.—[Ed.]

inflammation beginning within the bursa upon the patella, or supervening upon any accidental inflammation at that part. This abscess extends laterally on both sides, spreading over the joint, so that if pressure with the finger be made on one side, fluctuation will be felt on the other side, leading to the suspicion that the abscess or collection of fluid is really within the knee-joint, and fluctuating through the interior of it. Under the supposition that it is an inflammatory effusion, it may create a great deal of unnecessary alarm. Upon careful examination, however, it will be found that a thin layer of fluid is conveyed over the patella from one side to the other, thus marking the ex-articular position of the abscess. I would not place such a rudimentary case before you, except to controvert an error which not unfrequently occurs, and which I know has led to the death of two persons by giving time and opportunity for the abscess to find its way into the interior of the knee-joint. In cases of this kind of abscess, whether they originate in a bursa or some other structure, it is of little use to open the abscess at its top—that is, over the patella. I have seen many examples, and it has been almost invariably necessary ultimately to open its lower part on each side. In one case, in which this was not done early enough, the abscess found its escape under the fascia of the thigh, and became a very large sub-fascial abscess. This might have been obviated if one aperture on each side had been made, so as to prevent extension upwards.

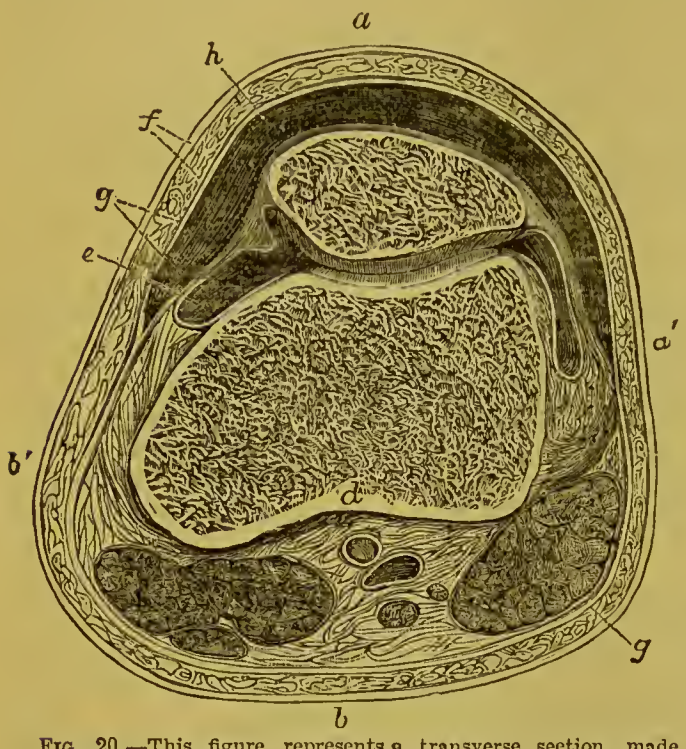


FIG. 20.—This figure represents a transverse section, made from nature, of the knee-joint and surrounding soft parts, including the popliteal space. The joint is in a state of extension, and the section is made above the semilunar cartilages, and higher than the femoral attachments of the crucial ligaments. *a*, Anterior part of knee-joint. *a'*, Outer side of joint. *b*, Posterior part of joint. *b'*, Inner side of joint. *c*, Patella in section, with a thin layer of fascia upon it. *d*, Femur in section. *e*, Interior of joint, bounded by synovial membrane, and extending between the patella and femur. *f*, Skin and subcutaneous areolar tissue. *g*, Fascia lata. *h*, Space occupied by an abscess, extending over the patella and posteriorly on both sides of the joint, overlying the lateral prolongations of the synovial capsule upon the condyles of the femur.
This drawing, and some others used in these lectures, were copied from fresh dissections, kindly made for me by my colleague Mr. Durham, Demonstrator of Anatomy at Guy's Hospital.

It is true of this kind of abscess, that after opening the top of it, if the knee-joint can be carefully strapped on each side, so as to secure accurate coaptation of the walls of the abscess, we may now and then succeed in closing it. But in this proceeding there is some little risk of the whole of the matter not being evacuated. Pressure also may lead to ulceration towards the interior of the joint; for abscesses follow in their course the direction of the least resistance, and the interval between the abscess and the interior of the joint may be very slight. It has fallen to my lot to see one case (it occurred in the practice of a surgeon in Finsbury Circus who is now dead) in which too long delay in opening such an

abscess allowed it to make its way into the knee-joint, and caused the death of the patient.

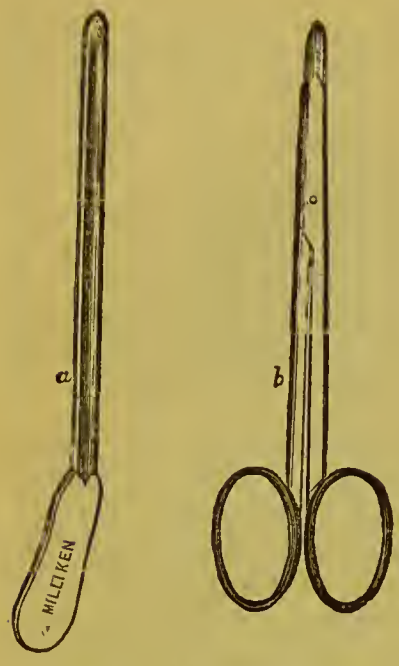
Axillary Abscesses.

A large abscess extending high into the axilla, under the pectoral muscles, should be opened from the axilla, through the floor of the abscess. If you open the abscess at the upper and anterior part of the axilla, you open the top of the abscess, and the tediousness of the case annoys both patient and surgeon. Many years ago, I saw, with Mr. Blenkarne, a case of this kind, in which this difficulty and annoyance occurred to us. I stupidly opened the abscess at its upper and anterior part; the man was relieved, but it was many weeks before he got well. My error was, that I had opened the top instead of the floor of the abscess; we could not keep its walls quiet, and Nature had to fill it up from the bottom, under the disadvantage of frequent disturbance by the movements of the shoulder.

To make the opening into an abscess at its most depending part is not always a very easy and safe proceeding; hence it becomes important to ascertain, as far as we can, what is the safest and best method of opening a deep abscess. Here I must take the opportunity of mentioning to you a method that I have employed for this purpose during a great many years, and I have never seen a single inconvenience arising from it. Persons have died, and many lives have been endangered, by hæmorrhage consequent upon opening a deep abscess by the lancet or bistoury. Within the last twelve months I have known two lives placed in great jeopardy by the use of the lancet in opening deep abscesses. These circumstances alone will, I hope, be a sufficient excuse for my bringing this subject before your notice. My own long experience of its value justifies the high opinion I entertain of the method of opening a deep abscess which I am about to recommend to your notice as safest and best. It is safest, because it is scarcely possible to inflict by it any injury on blood-vessels or nerves. I think, too, it is the best plan; for if the deep opening into an abscess be lacerated and bruised, it is not at all likely to close by adhesion; and undoubtedly, when we have opened a deep abscess, we are desirous that the deep opening should not close immediately. In principle, all will admit that if a lacerated opening be made instead of an incised one, it will be under circumstances adverse to its quickly reuniting. Nay, more: supposing a lacerated wound, for example, to be made deep in the thigh, and a blood-vessel divided by being torn asunder, it would be a lacerated wound of the blood-vessel, and therefore not so likely to bleed as an incised wound.

Some surgeons, when speaking of deep abscesses, say with rash confidence, "Plunge in a knife." It is a grand term—"Plunge a knife into a deep abscess." It is not a courageous plunge for the surgeon; for it is without danger to himself, while perhaps it is a fatal stab to the patient. Some more careful surgeons say, "Wait until the abscess comes nearer to the surface, so that it can be opened without danger;" but the patient may die in the meantime. Now the plan I have been in the habit of adopting and recommending is this—in the case, for example, of opening a deep abscess in the axilla—cut with a lancet through the skin and cellular tissue and fascia of the axilla about half or three-quarters of an inch behind the axillary edge of the great pectoral muscle. At that part we can meet with no large blood-vessel. There is only a small branch of one

of the external thoracic arteries, which sometimes runs along the edge of the axilla; excluding that, which if wounded can be easily ligatured or twisted, so far as I can see, we run no other risk. Then push a grooved probe or grooved director upwards into the swelling in the axilla; and if you will watch the groove in the probe or director as it is being passed up through the comparatively healthy tissues into the axilla, a little stream of opaque serum or pus will show itself. Take a blunt (not a sharp) instrument, such as a pair of "dressing forceps," and run the closed blades along the groove in the probe or director into the swelling. Now opening the handles, you at the same time open the blades situated within the abscess, and so tear open the abscess. Lastly, by keeping the blades of the forceps open during the withdrawal of the instrument, you leave a lacerated track or canal, communicating with the collection of pus, which will not readily unite, and will permit the easy exit of the matter. In this way you may open an abscess deep in the axilla, or in other important parts of the body, without fear of inflicting any injury upon the patient. Having been connected many years with a large hospital, I have necessarily had good opportunities of trying this method. During that time I have not opened a deep abscess in any other way, and I can say, honestly and truly, that it has never failed, and that I have never observed any inconvenience from it.



a, Director. *b*, Dressing forceps.

FIG. 21.—The free end of the director should be made blunt and rounded: the last quarter of an inch of the groove ought to be increasingly shallow, until it emerges upon the rounded end of the director.

The end of the closed blades of the forceps should be of a size adapted to run easily in the groove of the director.

With respect to this method of proceeding, a curious circumstance happened to me. I was requested some years ago to see a surgeon in London, who was suffering from a large inflammatory swelling in the armpit, resulting from a wound made at a post-mortem examination. When I saw him, he had a dry, brown tongue, and was delirious. His pulse was very feeble, and there were other circumstances indicating that fatal mischief was impending. I opened the abscess in the axilla in the way which I have pointed out, passing the grooved director between two and three inches up into the axilla, and opening the abscess by a pair of dressing forceps. The patient got well, the starting-point of his recovery being the opening of the abscess. About ten years afterwards, this same surgeon came to me one morning, in a great hurry, to request me to go with him immediately to see a patient who was dying. He then told me that on the previous afternoon he had opened an abscess in the armpit. "I did it," he said, "as well as possible, without any difficulty, for I used Liston's knife" (blaming the knife for what had happened). "I opened the abscess yesterday, and let out the matter, and this morning I find the armpit fuller than before it was opened, and blood is coming out of the hole I made. The man is nearly dead, and his arm is as big as two." We went directly, and found the man nearly at the point of death from loss of blood. I had to enlarge the aperture in the axilla, so as to enable me to introduce my hand, scoop out the whole of the blood, and expose the

cavity to the external air. No further hæmorrhage occurred, but the patient was very nearly killed. Now, this was the very same surgeon whose axillary abscess I had opened with the dressing forceps high up (two or three inches from the surface), without doing him any mischief; while he himself wounded a blood-vessel in the armpit with "Liston's knife," and nearly killed his patient.

Orbital Abscess.

Some years ago I had a case in Guy's Hospital of a fractured base of the skull, the fracture extending across the posterior part of the orbit. After some little time the parts within the orbit began to swell, and the eye to be protruded. The patient was amaurotic on that same side, and was suffering very severely locally as well as constitutionally. With the hope and probability of finding a collection of blood or pus at the deeper part of the orbit, I made, with a common lancet, a small cut horizontally through the fibres of the orbicularis palpebrarum of the upper eyelid, and passed through it a grooved probe or director along the roof, towards the apex of the orbit. A little purulent fluid was visible in the groove of the director. I then introduced along the groove the blades of a small pair of dressing forceps, and opened an abscess by separating the handles of the forceps; the matter escaped freely, the patient was relieved of his distress, the pressure upon the optic nerve was removed, the amaurosis disappeared, and he ultimately recovered without need of further aid.

Deep Cervical Abscess.

About four or five years ago I was sent for by a surgeon in my neighborhood to see his wife. She was a delicate woman, in about the middle period of pregnancy, and it was feared that she would miscarry in consequence of her having a large inflammatory swelling deep in the right side of the neck. There was an obvious fluctuation in the swelling, and it was thought to be an abscess. She was suffering greatly, and the question was, how to reach the seat of the disease. I should not have dared to put a knife in, because, with all the anatomical accuracy which a surgeon may possess, it must be admitted that movable parts get very much displaced by the enlargement of an abscess, so that it is not possible for the best anatomists to tell with accuracy the exact position of those blood-vessels and nerves which it is important to avoid. I cut through the cervical fascia with a lancet, thrust into the swelling a grooved probe, and used the dressing forceps. In this way the abscess was opened, and the patient did perfectly well. The patient in this case was the wife of a surgeon, who saw the difficulty of opening the abscess, and who appreciated the advantages of this safe method of proceeding.

Post-pharyngeal Abscess.

A short time ago, while going round my ward at Guy's Hospital, a little child was brought in; and the circumstances of the case were shortly these:—She was an unhealthy child, twelve months old, and had a post-pharyngeal abscess, with disease of the cervical vertebræ. She had a large deep swelling in the upper part of the neck, on the left side, extending to the angle of the jaw. The carotid artery was pulsating upon the anterior surface of the swelling, close to the anterior edge of the

sterno-cleido-mastoid. The trachea was pushed forward and to the right side, and the tongue was protruded. My finger detected in the pharynx a swelling, which prevented deglutition. Respiration was extremely difficult, and the spine and neck were curved forward. Large superficial veins were crossing the left sterno-cleido-mastoid, and occupying the space between it and the trapezius muscle. Examination of the throat through the mouth brought on extreme dyspnœa, so that the child was nearly suffocated, the face becoming quite livid. On the previous evening a surgeon was called to the case, for the purpose of performing tracheotomy, but it was thought better to send the child to the hospital. When the patient was sent up into my ward she could not swallow anything, and it was expected that the child would die of suffocation if tracheotomy were not immediately performed. The post-pharyngeal collection of pus was the cause of all the urgent symptoms, but how to get at it without danger to the little patient was the question. In this case it seemed to me that if I made an aperture through the mouth, the child might be liable to suffocation by a large quantity of matter escaping into the larynx. I determined, therefore, to adopt the following expedient:—I carefully made an incision, about half an inch in length, with a lancet, through the sterno-cleido-mastoid, thus exposing the fascia underneath it; I then thrust a grooved probe or director through the fascia, towards the back part of the pharynx, when a little stream of opaque fluid came trickling down the director. I then ran the dressing forceps along the grooved director, made an opening into the deep abscess, and let out three or four ounces of pus. The exit of the pus was aided by passing my finger into the child's mouth, and pressing upon the posterior wall of her pharynx. The carotid artery subsided to its proper position, the breathing was immediately relieved, the patient lost all sense of suffocation, and some wine and water was quickly swallowed. The child left the hospital after six or seven weeks in a comparatively healthy condition.

I believe it would have been unsafe to have attempted to open this abscess in the neck, and close upon the spine, by any cutting or perforating instrument.

Oct., 1860.—This patient was seen three months arterwards; she was quite well as regards the abscess, and the spine was consolidating.

Iliac Abscess.

A man came under my care at Guy's Hospital, having received a kick from a horse over the left hip, which broke the os innominatum, and drove a large piece of it inwards towards the abdomen. Subsequently an abscess occurred under the iliacus internus, and thence it descended into the thigh, behind the femoral blood-vessels in front of the hip-joint, towards the inner side of the thigh. He was suffering great constitutional distress, and it became necessary to open the deep and obscure abscess. Believing that it could not be safely reached by a knife or bistoury, I made an aperture on the inner side of the upper part of the thigh by cutting through the skin and fascia lata, and exposed the gracilis muscle. I then ran the grooved director through the gracilis into the deep and painful swelling, and opened the abscess with the dressing forceps. The patient was relieved at once, and there was thenceforward neither difficulty nor danger associated with the case.

Sub-gluteal Abscess.

A few years ago I saw, with a physician and a surgeon, a young gentleman, in St. John's Wood, who had acute disease of the hip-joint, with deep fluctuation (abscess) under the gluteal muscles. The lad was very feeble, and dangerously ill, and it became necessary to relieve him. I made a small cut down to the gluteus maximus, not through it. I then ran a director through the glutcal muscles, and opened the abscess with the forceps without the slightest difficulty to myself, and without any important bleeding or danger to the patient.

Sub-fascial and Sub-muscular Abscesses.

I have over and over again pursued this same safe plan in sub-fascial or sub-muscular abscess or abscesses formed upon or under the periosteum in the thigh. It has occurred to me many times in such cases, after dividing the fascia lata, to see the healthy muscles project boldly and clearly in the wound; and, instead of cutting through them, I have reached the abscess by running a director right through the muscles into the collection of fluid, and then introduced the dressing forceps in the way I have described. It is, I believe, impossible that any surgeon can foretell the exact position of the branches of the circumflex arteries, or perforating arteries of the profunda, in a case of deep abscess of the thigh; so that when he plunges his knife into the deep swelling he can feel no certainty as to his being able to avoid blood-vessels or nerves. But if the plan which I have recommended be pursued, it is hardly possible that any such mischief or accident can occur; and I can add this satisfactory assurance, that I have not yet had a single case in which this method of opening deep abscesses has been followed by important hæmorrhage.

I have recently (October, 1860) seen a young patient, who a short time since had a deep abscess in the thigh, just above the knee-joint. The surgeon in attendance opened the abscess by some cutting instrument. Pus and arterial blood escaped from the opening, but the bleeding was stopped for a time by plugging the wound. A recurrence of sudden and profuse arterial hæmorrhage took place in a few days, which nearly destroyed the patient. It was then thought right to ligature the femoral artery at the upper third of the thigh, and the bleeding ceased from that time.

In the case of a patient having an abscess close upon the interosseous ligament in the forearm, if the attempt to reach it be made by cutting down upon it, it is extremely difficult, next to impossible, to ascertain previously the exact position and direction of displaced nerves, veins, or arteries; so it must be equally impossible to avoid, with certainty, wounding some of these important parts. But if you simply cut through the fascia so as to expose the muscle at the most prominent point of the swelling (taking care to avoid the course of the larger blood-vessels, which may be felt with the finger), and then thrust the grooved director through them down to the interosseous ligament, the matter will show itself by welling up the groove of the director, and the introduction of a dressing forceps will then complete the operation with safety.

I think I have now said enough of this operation. I have not brought it forward from any egotistical feeling, but simply for the purpose of

showing in what manner deep abscesses may be opened with the greatest safety.

Sinuses cured by Rest.

If a sinus remains a long time after an abscess, we are very apt to think that it depends on the bad health of the patient, and the custom is to send him to the sea-side, away from his ordinary occupation, and to leave the sinus alone; and certainly the sinus gets well. The result is, perhaps, not so much the consequence of improved health as of rest at the sea-side.

I will now place before you a short series of cases where abscesses or sinuses after abscesses, are moved by muscles, and are, therefore, very difficult to heal. With regard to many such abscesses or sinuses, if the surgeon will only take the trouble to ascertain whether the anatomical associations are such that muscular disturbance of the walls of the abscess can take place, and will adopt the right means to secure rest to the base of the abscess, or track of the sinus, I think he will discover that this kind of abscess or sinus, which seems to defy almost every kind of remedial agent, will be found amenable to a very simple method of treatment. *i.e.*, by rest. Walls of abscesses, influenced by muscular force, are to be treated by rest—that is, by preventing motion, and by the use of gentle pressure; or, when necessary, by the division of the muscle or fascia. The fascia may be considered as a portion of the insertion of muscle; for I apprehend there is no fascia in the body which is not influenced by muscle. Physiologically and surgically considered, fascia is one of the insertions of muscle—a point to which I may have occasion to refer in more detail at some future time.

Sub-occipital Abscesses.

An abscess under the occipito-frontalis muscle is sometimes very large, and resists surgical treatment for a very long period. Why is this? Let me remind you that the areolar tissue in which this abscess exists is abundant, and that the whole superficies or dome of the abscess is under the influence of the occipito-frontalis muscle. Hence there is no rest to the abscess; it never has a chance of quiet, or of accurate and persistent coaptation of its surfaces, from the disturbance produced by the movements of this muscle. That such abscesses are difficult to heal will be admitted when I mention the particulars of some cases; and I will endeavor to demonstrate to you that in the surgical treatment of such cases the great object should be to keep the occipito-frontalis perfectly quiet. I would say, then, that chronic abscesses or sinuses under the scalp may be cured by keeping the occipito-frontalis quiet and at rest by strapping.

In illustration I may mention this case. Last spring I was requested to see a stout gentleman aged fifty, who had fallen down the hold of a ship. He had been taken to the London Hospital, where his wound was well dressed. The anterior half of the scalp was injured; it had been turned forwards and downwards, quite over his face by the accident. This flap was replaced in accurate position, bandaged, strapped, and the patient was sent home. No primary adhesion took place in the wound, and in a few days his surgeon thought it right to take off the dressing, when it was found that the scalp itself was much swollen, and that the whole of it was lifted up or raised from the bones by sub-occipital suppu-

ration. The patient subsequently had two attacks of severe hæmorrhage, from sloughing and ulceration of the temporal arteries, which required ligatures. It is worthy of remark that the bones of the cranium were denuded of pericranium to the extent of several inches, and were daily exposed in this condition during nearly a fortnight. Yet the bones did not die, their nutrition being mainly derived from the blood supplied by the arteries of the dura mater. The wound was dressed daily with lint and warm water, and the pus squeezed out from under the whole of the occipito-frontalis; but the abscess would not heal, and the question was, how to get the pus from under the posterior part of the scalp—for there was no outlet for it in that direction—and how to secure rest to the movable dome of the abscess. The hair upon his scalp was shaved off, and long strips of plaster were so arranged across and around the head as to empty the abscess, to keep the occipito-frontalis quiet, and to press it downwards upon the pericranium and bones: this was done simply for the purpose of giving rest to the parts. The rapidity with which the abscess then healed was very remarkably in contrast with the tardy results of the previous daily dressing and emptying of the abscess. He got quickly well, without any necrosis of bone.

Sub-occipital Abscess and Sinuses.

The next instance I have to mention is of a patient who had suffered during a whole year from sub-occipital abscess and sinuses—sequelæ to suppuration—and who was cured by rest and pressure in from three to four weeks. It was the case of a girl, sixteen years old. Her general health had become exceedingly impaired, and her frame much wasted by the discharge from the sinuses under the occipito-frontalis and the swollen scalp. This abscess and the sinuses were originally the result of a blow, and she had been more than a year under surgical treatment. Sinuses had burrowed under the swollen œdematous scalp, traversing it in different directions, and communicating with each other. The cranial bones were found denuded of pericranium at two or three points, and profuse suppuration took place from the openings of the sinuses. (Here I may incidentally remark that profuse suppuration is tantamount to daily venesection—and this is the way in which I think a surgeon should regard excessive suppuration. The drain must necessarily keep the person in a reduced condition of health.) Poultices and stimulating injections had been used, with ointments to the scalp, and these had been assiduously employed during a twelvemonth. The head was now shaved, and numerous long strips of plaster, from half an inch to an inch wide, were arranged around and across the scalp, so as to keep the muscles perfectly quiet, while allowing the apertures of the sinuses to remain uncovered, thus permitting the escape of any discharge. Fresh strips of plaster were applied as soon as the others became loose from the gradual diminution of the size of the scalp, and the patient was well in three weeks.

Now this patient had suffered from abscesses and subsequent sinuses during a whole twelvemonth, the sinuses freely communicating with each other, with here and there denuded bone. Perfect rest was given to the walls of the abscess, by accurate adaptation with plaster, and the patient was well in three weeks. There was no exfoliation of bone, the chief nutrition to the bones of the head being derived, as I before remarked, from the dura mater, and not from the pericranium.

Some years ago, I saw, with the late Dr. Marshall Hall, a young gen-

tleman in Westbourne Terrace, who had erysipelas of the scalp, followed by sub-occipital abscess. We could not succeed in healing it until the head had been shaved and plasters applied, so as to keep the occipito-frontalis at rest, when he got perfectly and quickly well.

I may mention another case of the same kind. H. B——, aged twenty, general health good. Ten weeks before my visit he had received a blow upon the top of his head, which was followed by an abscess of considerable size under the tendon of the occipito-frontalis. It was opened by a surgeon, and had been discharging freely ever since; but when I saw him the discharge had ceased for a day, from temporary closure of the artificial opening. On passing a probe into this closed opening, between two and three ounces of thin sero-purulent fluid, tinged with blood, escaped from under the occipito-frontalis, leaving a large loose wall of scalp covering the seat of the abscess. The head was shaved, a pad of lint was placed upon the loose portion of the scalp, and there strapped down with moderate pressure, leaving the opening free so as to allow of the escape of any discharge of pus or serum. On July 14th, eighteen days from the beginning of the treatment by rest, this was the state of the patient:—Walls of abscess have almost entirely united; little or no discharge; strapping applied to-day for the third time. On the 21st of July the patient was quite well, having been cured by local rest.

Sub-occipital Abscess, with Ulcer on the Forehead.

About the end of September, 1848, Edward L——, aged twenty-seven, applied to me with a large, deep ulceration of the integuments of his forehead, and sub-occipital suppuration two inches above the ulceration. He had been under the treatment of an hospital surgeon, uninterruptedly, during seven months, without benefit, the means used having been poultices, stimulating injections, ointments, and various medicines. This ulceration, influenced by the corrugatores and occipito-frontalis, was situated near the middle of the forehead, chiefly over the left frontal sinus: the ulcer and the walls of the abscess or sinus were freely movable by both these muscles. Two long strips of adhesive plaster were applied transversely across the forehead, extending laterally to each temple; and one long piece was applied vertically, extending upwards from just above the nose, and near the median line, along and over the vertex of the head to the occiput, a path having been previously made by cutting the hair along the intended course of the plaster; a bandage was then passed several times firmly around the head. All this adjustment was made for the purpose of opposing the disturbance of the parts influenced directly by the muscles to which I have alluded. Nothing else was done. The ulceration began to improve; and on November 9th, 1848, my notes report him well, so that in four or five weeks it was healed; but as the cicatricial structures were yet feeble, one transverse slip of plaster was worn, so as to steady the base of the ulcer, until February, 1849. I saw this patient during the summer of 1849: he continued perfectly well. He was cured by giving *rest* to the base of the ulcer, the muscles being kept quiet by plasters. I happen to know that this patient had had the advantage of very good professional advice; but I think that his professional adviser did not recognize the simple cause which interfered with Nature's healing process. It was only by the recognition of the fact that the abscess was so placed as to be under the direct influence of various antagonizing muscles which were contending against each other, and making traction upon and dis-

turbing the base of the sinuous abscess in various directions, never allowing the ulcerated surface to have any rest, that the method of cure was pointed out.

Cervical Abscess under the Platysma Myoides.

Abscesses in the neck, under the platysma myoides, are well worthy of your attention. When these abscesses are opened either by the surgeon or by Nature, they are sometimes very difficult to heal. I believe the great difficulty depends upon the fact that they are under the influence of the platysma myoides. Some time ago, my friend, Dr. Daldy, brought to me the son of a clergyman, who was suffering from a large ulceration, the sequel of an abscess, lying deep in the neck. He had had the advantage of good professional attendance and general treatment ; but the ulceration not only did not heal, but was slowly extending. We determined to see the effect of rest to the ulcer. Strips of plaster were placed across the neck, and a layer of cotton wool over the plaster and the ulcer, upon the side of the neck ; these means, aided by gentle bandaging, kept the platysma myoides quiet. The ulceration had existed a considerable period before I saw the patient, going on from bad to worse ; but immediately on this plan being carried out, the surface of the ulceration began to improve in appearance and to diminish in size, and in a very short time was perfectly well, although the child was not, upon the whole, a very healthy subject.

Deep Cervical Abscess, followed by a Sinus.

I have here the notes of another case, where a sinus existed in the neck, which was cured by rest. This case was of two years' duration, and was cured in three weeks. I am almost afraid you may be induced to fancy I am using the language of exaggeration in this statement ; but I really am not.

In 1849, Elizabeth H——, aged twenty, living at Lambeth, had had a large abscess extending deeply under the platysma myoides and the sterno-cleido-mastoid. This had continued as a long sinus, discharging freely during many months. She had been an hospital out-patient for two years. Iodine, &c., had been injected into the sinus, and a seton passed through it, and retained within it for some time without any benefit. Strips of adhesive plaster were drawn tightly over and across the muscles covering the sinus, and the head was steadied by a pasteboard splint, cut rudely into a form which could be adapted to the body, along the back of the shoulders to the back of the head, and then laterally on each side, so as to embrace the whole of the head in a circle of pasteboard. This splint was made off-hand with wet, soft, thick pasteboard, covered by linen, pressed upon the surface of the body, so as to become moulded to it, and then allowed by the bandaging to dry firmly in its position. A figure-of-8 bandage was then applied over this apparatus around the head and under the axilla, crossing in front of the chest, so as to fix the head and neck forward and a little downwards firmly upon the shoulders, and to relax the muscles. At the end of a fortnight the sinus ceased to discharge ; but she continued to wear the apparatus for a short time—about three or four weeks—longer, as a further security.

This patient was thus quickly cured by rest.

Small Superficial Cervical Abscess.

We are often troubled how to deal satisfactorily with the results of small superficial abscesses in the neck. Such open abscesses under the skin are mostly said to be scrofulous; but I suspect their persistence depends not unfrequently upon their close relation to the platysma myoides. I believe—and I am speaking here from experience—that by placing a pad of cotton wool, twice as large as the area of the disease, over the part, and by fixing it there so as to keep the platysma myoides and all the surrounding parts at rest, many of those cases that seem to defy almost every kind of treatment may be successfully dealt with. I have had opportunities in very many such cases of observing the success of this treatment.

Cases of Carbuncle, followed by Sloughing.

We all know that it is not easy to manage successfully the treatment of a patient who has had a large carbuncle on the back of the neck near the scalp, which, by destroying the subcutaneous areolar and fascial structures, has left large portions of loose overlapping skin, blue, dark-colored, and congested, showing a very feeble power, and, in addition to this, exposed the trapezii muscles to view. Now I wish to show the therapeutical value of local rest in the treatment of such a case.

Two years ago I saw the wife of a physician, whose condition accurately resembled that which I have just delineated. She had been previously attended by a very eminent London surgeon. The case was not proceeding satisfactorily; there was no local evidence of repair; and the wound had remained stationary some time before my visit. On looking at the patient's neck, it appeared to me that there were two additional requisites in the treatment which might help the cure: one was to arrange some simple mechanism which would keep the trapezii muscles quiet; and the other, to support in their proper positions, and to maintain in a state of perfect rest, the loose feeble flaps of skin. I hoped by such means to facilitate adhesion of the two granulating surfaces. The loose flaps of skin were laid neatly upon the subjacent trapezii, and then a large thick pad of cotton wool was firmly fixed upon the surface of the flaps of skin and surrounding parts. A bandage was applied around the head, and extended as a figure-of-8 bandage, crossing behind the neck and under the armpits, in order to fix the head, neck, and shoulders, and control the trapezii. In twenty-four hours the healing commenced, and proceeded, under the same local treatment, to the most satisfactory and speedy termination.

Not long after that time I saw a patient in the Clapham Road, with Mr. Wright, where just the same circumstances occurred, with exactly similar treatment, and precisely the same result. Here the parts were kept at rest partly by a thick pad of cotton wool pressing upon the flaps, and by means of a bandage to keep the head and the trapezii muscles in a state of rest. Cases of a like kind, with the same result from similar treatment, have lately occurred to me in Guy's Hospital.

Popliteal Abscess and Sinuses.

Sinuses in the popliteal region, in unhealthy subjects, are very difficult to cure, except by local rest; and here I will take the liberty of reading part of a note which I received from a surgeon in Essex, who had sinuses at the back of his knee-joint:—

"Jan. 9th, 1853.—My sinuses occurred after an abscess in the popliteal space, which left a very irritable, unhealthy ulcer, the size of a walnut, and several long and deep sinuses extending from it, amongst the tendons of the hamstring muscles. Not being able myself to improve this ulcer, I consulted the late Sir A. Cooper, who stated that it was owing to a defective state of my general health, and ordered me steel and quinine, to inject nitric acid lotion, to take exercise, and to wear a high-heeled shoe. At the end of many weeks the ulcer and sinuses remained as they were. You then saw me, and ordered my leg to be flexed, and placed upon a resting splint upon a wooden leg, with moderate pressure upon the sinuses by soap plaster. I continued this plan. In two months I was quite well, have been so ever since, and am in active occupation in my practice."

Small Facial Abscess.

In some small abscesses sometimes occurring in the face, cheek, or neck, which have opened by a minute ulceration through the skin, the aperture communicating with the sac of the abscess, I have found the happiest results from carrying out this principle of rest to the part. I have merely passed a small probe into the aperture in the skin for the purpose of keeping it open whilst collodion was being applied upon the dome of the abscess, so as to press the dome upon the floor of the abscess. In this way pressure and rest are secured, and by coaptation the parts are kept undisturbed. The process of healing then commences, and I think the patient gets well more quickly by this than by any other local method of treatment.

Sinuses, then, are cured by the adoption of local rest; and I think that if surgeons, instead of affixing to every sinus the opprobrium of bad general health, would take into consideration the possibility of there being some special local disturbing cause associated with it, such as muscular or other movements, more success would result from the very simple plan of treatment by rest.

Painful and Irritable Ulcers.

I promised, before concluding these lectures, to refer to some surgical cases which show the good effect of "physiological rest." As yet I have scarcely had an opportunity of alluding to the subject. The only example of the principle of "physiological rest" as a curative agent which time will admit of my using is that of the painful irritable ulcer. An irritable ulcer is to be distinguished, no doubt, from an inflamed ulcer, by the quantity of lymph which is poured out upon the inflamed ulcer, and the high degree of its temperature. Irritable ulcers, as we know, are exceedingly painful, and sometimes very difficult to cure. As far as I have been able to detect their real essential pathological character, it depends upon the exposure of a nerve on the surface of the ulcer. Of course it is quite clear that every ulcer must have nerves more or less exposed on the surface; but in the case of an irritable ulcer, it seems probable that the sheath of the nerve is destroyed, and that the end of the true nerve-fibre or tubule remains denuded, and so causes the exquisitely sensitive and painful character of the ulcer. Upon this exposure of nerve depends, I believe, the chief feature of what we term an irritable ulcer, and the method of detecting the precise seat of the exposed nerve is very simple. You must understand that my remarks on this subject are founded on a

twelve or fourteen years' experience of such cases. Having a very painful uninflamed ulcer before you, you apply the blunt end of a common probe upon the sore, and, as you move it about, the patient presently exclaims, "Oh! there you hurt me dreadfully." You then go a little further on with the same method of examination, and scarcely any pain is felt; but on coming back to the same spot, the patient is again "dreadfully hurt." At that painful spot some small nerve is exposed on the surface of the ulcer. The first time I observed this fact, and arrived at what I believed to be the right interpretation of it, was in the case of a patient who had a thecal bursa extending from the palm of the hand under the annular ligament to above the wrist. I made an aperture into the bursa above the wrist large enough to let out all the fluid and solid contents. The bursal swelling gave me no special trouble, and was speedily cured; but at the seat of the opening a very irritable painful ulcer remained which I could not heal by any local application. On examining the ulcer with a probe, I discovered a point of exquisite tenderness. The normal position of the small palmar branch of the median nerve corresponded with the site of the local sensitiveness, and seemed to explain the pain. I then passed a small pointed bistoury under the track of the nerve above the tender spot, so as to divide the nerve between the spinal marrow and the irritable point of the ulcer; from that time the pain ceased, and the ulcer rapidly healed. It was cured by the "physiological rest" resulting from the division of that little nerve.

Painful Granulations following Injury.

Some long time after the occurrence of this case, I had a patient in Guy's Hospital suffering greatly from an ulcer at the end of the finger, in which, as the original injury was a cut from breaking a window, it was supposed there was a piece of broken glass. She had been under the observation of a surgeon, who had tried repeatedly to get out the suspected piece of glass, and had severely but unintentionally punished her. She came into the hospital, and I thought the case would give me a good opportunity of making a demonstration of what I had long deemed and taught to be correct. On placing the broad end of my finger upon the ulcer, it gave her exquisite pain; the broad surface of my finger, however, was not a sufficiently accurate localizer of the pain. I then employed the rounded end of a probe, and with great care examined the whole surface of the ulcer by pressure, until I came upon a spot that was exquisitely tender, and produced dreadful pain to the patient. With a pair of scissors I cut out the painful granulations. Explaining to Dr. Habershon, then Demonstrator of Anatomy at Guy's Hospital, the views I entertained regarding the cause of the painful granulations, I requested him to examine them by the aid of the microscope, and he found in them, and near the surface, as I had expected, looped filaments of nerves, thus completing the demonstration of the cause of the pain. From the time of my cutting away those sensitive granulations the pain ceased, and the sore began to heal; there was no more trouble or difficulty as regards the treatment of the ulcer: it got well by giving it "*physiological rest.*"

Exquisitely painful Ulcer after Injury.

About a year and a half ago, I was requested to see a gentleman's coachman, who, on getting off his box seat, slipped his fingers between the lower bar and the seat, and thus had two of his fingers broken off at

the second phalanges. One of them went on rapidly towards healing, and did so very well. The other remained swollen, irritable, very painful to the touch or on exposure to the air, preventing sleep, and producing great constitutional disturbance. We failed to relieve these symptoms by the local and internal employment of opium. This unhealthy condition could not be from any constitutional defect, because one finger did well; nor could it be from the result of any dissimilarity of the original injury, for they were precisely alike. With the surgeon in attendance, I made a careful examination of the part; and when I placed the end of a probe towards the edge of the ulcer upon the finger, it detected a spot which was exquisitely tender, and the patient screamed out—"Oh, pray, for God's sake, cover it over! I can't stand it." The position of this pain was in the course of one of the lacerated digital nerves. I passed a pointed bistoury under the nerve, about one-fourth of an inch above its exposed portion upon the wound, and so divided it. The pain in the ulcer ceased immediately, and the touch of the probe caused no uneasiness. From that time all the local symptoms rapidly improved, and the case gave no further trouble, being quickly cured by "physiological rest."

These cases prove distinctly that an ulcer may be very much modified in its character from the exposure of a nerve in the wound.

I mentioned this subject to my colleague, Mr. Cock, some time ago, and shortly afterwards he had an opportunity of testing the value of the observation. He recognized the condition of such an ulcer as that I have referred to, and divided the exposed nerve; the patient lost the pain, and the ulcer quickly assumed a healthy character and got well.

Painful Irritable Ulcer of the Leg.

I have here short notes of two other cases that have lately occurred, under my care, at Guy's Hospital, to which I will, with your permission, now allude.

John J——, aged twenty-seven, a sailor; admitted on the 9th of November, 1859, suffering from a syphilitic sore on the frænum and penis, with secondary eruption and a very painful ulcer on the inner malleolus of his left leg. The syphilis was treated and cured by Plummer's pill, five grains, twice a day; but the painful ulcer remained uninfluenced by the mercury.

This is the history of the ulcer recorded by my dresser:—

"When leaping, about four years ago, he sprained his ankle, and an ulcer formed on the inner malleolus of the left leg. It had made frequent efforts at healing, but never cicatrized completely. It now looked irritable, with no inclination to heal, and was very painful, with intense nervous sensibility localized at its upper margin, which was ascertained by examining it with a probe.

"Jan. 24th, 1860.—Mr. Hilton passed a pointed bistoury a little distance above the tender spot, under, and then through, the granulations, thereby severing the filaments of the nerves supplying the morbidly sensitive granulations; and although the patient made much ado about the operation, yet he immediately acknowledged himself relieved by it. The ulcer readily assumed a healing aspect, sensation over the other parts of the ulcer was not more acute than normal, the surface became covered by healthy purulent exudation, cicatrization daily advanced, and the ulcer was closed in a fortnight, and remained so until he left the hospital, on the 8th of March, 1860."

This was a case of irritable ulcer, cured by division of the nerve.

The other case may be put before you in a few words:—

Jan. 11th, 1860.—The painful spot of an old irritable ulcer was examined by a probe; the nerve supplying the tender granulations was divided; marked relief was the immediate consequence. This division of the nerve was done on the 11th of January, and on the 16th this is the dresser's report:—

"The ulcer above mentioned is free from pain, and has assumed a healthy character; its edges are throwing new skin over the granulations." From this time the painful ulcer required no special attention, and in ten days all was healed.

These are cases that appear to me to display very accurately the therapeutic value of what we may fairly term "physiological rest," by removing the abnormal sensibility of the surface of the sore. The division of the nerve had its effect upon the neighborhood *physiologically*, and the ulcer began to heal.*

I trust I may have succeeded in thus briefly pointing out the true pathological feature of what is termed a "painful irritable ulcer."

* Mr. Hilton has furnished me with the following notes, which show that "physiological rest" is in this class of case of as much importance in private as in hospital practice:—

"Soon after the delivery of these lectures, Mr. Quain, who was at that time called away from London, placed under my care a patient who had for many months been suffering extremely from a most painful irritable ulcer on the lower third of one of her legs. This ulcer had resisted well-directed treatment of the usual kind. When Mr. Quain and I saw the ulcer it was circular in shape, about an inch and a half in diameter, and so sensitive that my blowing a breath of air upon it caused the patient exquisite pain. We then examined the surface of the ulcer by the aid of a blunt probe, so as to indicate the exact position of the most sensitive points, of which there were several. Opposite to each of them, and about one-eighth of an inch from the edge of the ulcer, I passed a sharp-pointed bistoury through the skin, and divided in each case the subcutaneous tissue containing the branch of the nerve, the end of which was exposed upon the ulcer. This division of the nerves rendered the ulcer almost painless, and the patient expressed herself as much relieved. No special treatment was required; the patient, freed from the pain by which her health had been much impaired, was enabled to take her food and enjoy plenty of sleep. Healthy pus soon appeared upon the surface of the ulcer, the healing process was quickly established, and the lady returned to her home cured."—[ED.]

LECTURE VII.

Case Showing the Danger of Opening an Abscess in the Thigh by a Lancet—Case of Sloughing of the Scalp—Sinuses Cured by Application of a Truss—Irritable Extremities of a Nerve in a Wound Relieved by Division of the Nerve—Headache and Intolerance of Light Cured by Physiological Rest—Design Manifested by the Same Nerves Being Distributed to a Joint and to the Muscular Apparatus Used for the Motion of the Joint—Application of this to Explain the Involuntary Flexure of an Inflamed Joint.

While I endeavor to illustrate still further the principles on which I have insisted in my previous lectures, it seems to me but right that I should briefly recapitulate the leading features of the subject with which our attention has been occupied.

It may be remembered, then, that we first hastily glanced at the importance which Nature seemed to have attached to the attainment of "physiological rest," as exemplified in the marvellous provisions which she had made for it in the vegetable and animal kingdoms. After a somewhat minute review of the equally wondrous and efficient, yet simple, expedients adapted to the same end, with which each of the several organs of our own highly complex system is endowed, I proposed to myself, and scrutinized as well as I was able, the application of these primary principles to the treatment of various forms of disease. I remarked that the subject grew with contemplation; that, narrow as it appeared when adopted as a mere platitude, or in its axiomatic form—"Rest is an important agent in the cure of disease," when employed in relation to the countless forms of disease presented to the observation of the surgeon—it expanded and enlarged in its proportions, like the series of circles extending from a pebble thrown into the water. I feel my subject is by no means exhausted, and I pursue it in the hope that I may thereby excite in others, more capable than myself, a spirit of research into those deeper recesses of the existence of which I am convinced.

This is no new subject of inquiry. Perhaps there are few thoughtful members of our profession to whom it has not suggested itself; and my reason for discoursing upon it is rather for the purpose of gathering together in a connected form notions which had long been floating vaguely in the minds of others as well as my own, and which required to be collected that they might produce precise results. As far as my knowledge extends, this has not been done, even in the meagre degree in which I now present it to you. But as an evidence that it has long been present to the reflective minds of our profession, I may mention that since my last lecture I have met with a prize essay on the subject of "Rest," by a French surgeon, M. David, presented to the Royal Academy of Surgery of Paris so long since as 1778. The subject proposed by the Academy for the prize essay of that year was "to explain the effects of motion and rest, and the indications according to which either should be prescribed in surgical diseases." M. David, the successful competitor, in accordance with the phraseology of his day, speaks of man as the epitome of the

universe, and of fire as the great moving principle; and proceeds to lay down the following converse propositions: "If it be required to resist or prevent the inspissation of the fluids in the cure of these disorders, it will be necessary to call in the assistance of motion, provided there be no particular circumstance that renders the use of it improper. If, on the contrary, the plan of cure require to give a better consistence to the fluids, and if the effects of motion should counteract this plan, we must have recourse to rest." Pursuing these propositions, he dilates freely on the subject of motion as applied to rheumatism, gout, anchylosis, and so forth; rather as if for the purpose of creating a marked antithesis to the use of rest, than of especially treating of rest itself as a curative agent. On the latter point, however, after relating some cases of chronic vertebral disease which had been benefited by rest, and dwelling upon such obviously necessitous cases for its adoption as dislocations, rupture of tendons or muscles, contusions of joints, &c., he suggests its application to the treatment of sinuses and fistula of the anus.

Hence I believe I am only arranging, in an approach to a systematic form, the fragmentary atoms of a great principle, which has occurred to the minds of very many surgeons. Fortunately, from my position, I am enabled to illustrate that principle by cases deduced from my individual experience, and thus, I trust, to impress it on the minds of others, who will extend its application. At any rate, I can say,

"fungar vice cotis, acutum
Reddere quæ ferrum valet, exors ipsa secandi."

Before proceeding to a further and wider examination of the therapeutic value of Rest, I would solicit your attention to three or four additional cases, illustrative of some of the points which I have had the satisfaction of previously placing before you. These few cases are good examples, perhaps, but form only a small portion of the numerous instances which I could adduce; yet they will serve to show that the subject has an important bearing on practice. It will be remembered, that the series of facts which I brought forward, for the purpose of exemplifying the value of Rest as a curative agent, consisted partly of cases of diseased spine, taking my examples of disease from the highest portion of the vertebral column. These were selected specially on account of the danger which so frequently attends their professional mismanagement. I hope now to place in detail before you more cases of diseased spine, situated lower down, and cured by Rest.

I also endeavored to call your attention to what I deemed to be the safest and best method of opening deep abscesses; namely, by a lancet, grooved director, and ordinary dressing forceps. As I have had a case before me, full of point with respect to this subject, I will detain you by relating one or two facts regarding it:—

A young lady, aged thirteen, had a deep abscess in the lower third of the left thigh. As far as I can judge of the case by the history which I have received, the abscess was associated with periosteal or sub-periosteal inflammation, for the abscess was deep under the muscles. It was opened at the lower and inner part of the thigh with a lancet or bistoury, by one puncture or clean incision, which reached the abscess. Pus escaped, mixed with a considerable quantity of arterial blood; and after all the purulent fluid had been evacuated, arterial blood still flowed from the aperture. The aperture was then plugged. On the third day, the plug being removed, a little hæmorrhage took place, and it was plugged again.

On the seventh day after the opening of the abscess, a most profuse and sudden arterial hæmorrhage occurred, bringing the patient really to the very brink of the grave. At that time a consultation of surgeons took place, when it was determined to tie the femoral artery. This was well done, just above the middle of the thigh, and there was no subsequent hæmorrhage. I saw this young lady in London last October. She was then in an extremely emaciated and depressed condition, with a slough upon the back. The aperture made by the lancet was still there, and pouring out daily a small quantity of sero-purulent fluid. I need not trouble you with any further particulars of this case, except to express my opinion, not in opposition to the gentlemen to whom the case occurred, but as bearing upon the facts which I have brought before you. Had this abscess been opened in the way I have suggested, I think the extreme danger to which this patient was subjected might have been avoided. My plan would have been to cut down to the fascia lata, dividing the fascia lata only, and then (instead of allowing the lancet to pass into the deeper-seated parts, where it was impossible to predetermine the precise position of the subjacent arteries) to thrust the grooved director through the vastus internus muscle, and open the abscess by the dressing forceps, guided into it by the groove in the director.

I took occasion also to refer to the treatment of abscesses by "rest," and I brought before your notice some cases of abscess under the occipito-frontalis muscle—abscesses most difficult to manage, except upon one principle, the use of mechanical means to keep the parts in a state of quietude or "rest."

Since then a most curious and remarkable case has been brought under my notice at Guy's Hospital;* it is here depicted (Fig. 22):—A man (W. D——), aged sixty-three, in January, 1860, fell from the rigging of a ship, his head coming in contact with a bar of iron in a barge, producing extensive laceration of his scalp. He was professionally attended to immediately, adhesive plasters were applied, and the edges of the wound were adjusted; but, from what cause I do not know, these plasters were allowed to remain on the man's head eleven days undisturbed. He was not, I think, under professional care during that time. The plasters were then pulled off by himself, and subsequently he had several attacks of erysipelas and sloughing of the scalp. In May, four months from the time of the accident, he and his surgeon began to notice that the scalp was falling, like a land-slip, gradually sliding down the side of the head till it ultimately attained the displaced position which you see in this portrait (Fig. 22). The space between the fallen scalp and the edge of



Fig. 22.

* I have especially guarded myself against introducing into these lectures any cases from Guy's Hospital, except those which have been entirely under my own care and treatment. I mention this because I should be very sorry to lie under the serious imputation of quoting or using the unpublished cases of my hospital colleagues, for the purpose of illustration, without their permission, and a full acknowledgment of the source from which they have been derived.

the granulating surfaee is now oeeupied by newly formed skin, free from hair. A considerable portion of the parietal and adjoining bones has been detached from the top of the head, so as to expose the pulsations of the brain near the centre of the large and massive granulations, which are shown in the drawing. I adduee this case for the purpose of supporting the opinion that the whole of this mischief might have been avoided if attention had been paid to what I have alluded to in my previous lectures; that is, the use of some meehanieal means, such as straps of plaster placed around and over the sealp, to maintain the oecipito-frontalis in its proper position. In this case the subjacent areolar tissue sloughed; there was nothing to hold the occipito-frontalis, and it slid off the side of the skull. I might add another practical remark. I think it is probable that if the scalp had been carefully retained *in situ* on the top of the head, the loss of bone would not have been so extensive. The portions of detached bone, when put together, make a large piece, somewhat circular in form, with a diameter of about four inches. The exfoliation is confined to the external plate of the cranium and diploe, except near the parietal foramina, where a piece of the internal plate or table is visible on its concave aspect, and it is at the corresponding part of the exposed dura mater that the distinct pulsations of the brain may be seen. Although I am aware that the chief nutrition of the bones of the head is obtained from the dura mater, yet no doubt some portion of it is derived from the periosteum or pericranium. The pericranial membrane was destroyed by its exposure, and hence the sloughing that occurred. This picture (Fig. 23) represents the patient after the operation which I performed upon him. It is perhaps rather too flattering to the patient, and a little too complimentary to the success of the surgeon's efforts. But I would ask you to remark one other point in this ease with referenee to the influence of rest. The granulations in this drawing, although not artistically well depicted, do exhibit a healthy character, and the area is mueh diminished, and is still diminishing. This improvement has occurred sinee the removal of the hanging mass of the scalp, which by its weight was making constant traction upon the healing scalp, and so interfered with Nature's curative efforts. By taking away the depending portion of scalp, I gave "mechanical rest" to the margins of the uleeration, and thus enabled Nature to concentrate her attention



Fig. 23.

more upon the healing of the exposed surface; and now the condition is that which is here represented.

The cure of sinuses by "rest" was another subject that I brought forward, and I may here mention an additional case or two bearing upon this point which have since occurred.

On November the 21st, 1860, a gentleman, aged twenty-three, consulted me with regard to a sinus in his right groin, which was the sequel to an extensive suppuration which took place in a glandular swelling below Poupart's ligament, three or four months previously. The abscess had been first punctured, and subsequently freely cut along its whole length, near its lower boundary. The sinus did not heal, and the gentleman was sent to Ramsgate, where he remained three months, during which time he wore a pad of lint bandaged over the parts, with the idea of making pressure upon them. Upon his return to town, there being scarcely any improvement in the condition of the ulcer and sinus, he was ordered by his surgeon to return to the sea-side for the winter, for the further improvement of his health. It was at this time that I was consulted. The gentleman explained to me that he had made great sacrifices from the commencement of his illness, several months back, to the present time, by absenting himself from business, without any benefit to the sore, and that he could not afford to lose more time, except as a matter of necessity. On examination, I found a short sinus, about an inch in length, running parallel with Poupart's ligament, on the right side, and then communicating with a cavity having granulating walls. One granulating surface passed underneath an overlapping piece of skin, about two inches long and three-quarters of an inch wide, which rested in part upon a long slip of exposed granulation, extending below the margin of overlapping skin. Both surfaces were covered with granulations, and the two were moving freely upon each other. It appeared to me that this gentleman's health was pretty good, and all that was required would be to apply something to make a steady pressure upon the flap of skin, so that these granulating surfaces might be brought in contact, and maintained in that state, for the purpose of aiding secondary adhesion. Just as when primary adhesion fails in the operation for hare-lip, by bringing the granulations together they unite, and the reparation is tolerably perfect. For the purpose of securing this necessary adaptation of the granulating surface in this patient's case, I recommended him to wear a truss of this kind (Fig. 24), which was well adapted to relieve his condition. Towards the large end of the truss is introduced a ratchet wheel, regulated by a key. This is capable of turning the pad inwards upon the sinus almost to any extent; and if the patient finds the pressure too great, he can himself reduce it with facility and precision. This truss was applied, and I advised the patient not to sacrifice more time, but to attend to his business, and not go into the country. In a fortnight the sinus had nearly healed. On the 8th of January, 1861, it had completely healed, and the discharge had entirely ceased. The skin over the wound being then thin and delicate, I

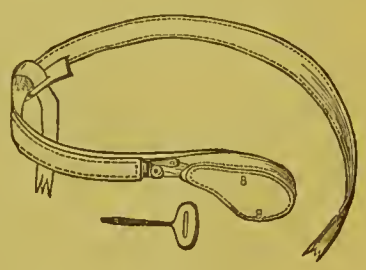


Fig. 24.*

* This truss is well adapted for the treatment of some troublesome cases of hernia requiring nicely adjusted pressure, and exactitude as to the direction of the force to be employed.

requested him to wear the truss a few weeks longer, which he did, and then everything was perfectly well. In the spring he went out hunting, and the friction of the truss led to a little excoriation, which required some temporary attention.

Thus we see that the simple treatment by Rest—that is, by bringing the granulating surfaces together, and keeping them quietly in contact for a short time—did away with the necessity of this gentleman's quitting his business and making large personal and pecuniary sacrifices, for the purpose of doing what would not ultimately have led to much, if any, improvement in his sinus and concealed ulcer.

In the summer of 1859, my opinion was requested regarding a gentleman, aged forty-two, who had just then sought advice in reference to some sinuses in his groin, which had remained after glandular enlargement and suppuration, associated with non-syphilitic ulceration upon the prepuce. The patient had been, during the three previous months, uninterruptedly under the care of an hospital surgeon, who had used many different local applications to the sinuses, and had given him mercury internally, with rest at his home, but all without any benefit. His surgeon had told him that nothing remained to be done but to "lay the sinuses open, and make them heal from the bottom." This gentleman, who was in good health, refused to be cut, and sought the advice of Dr. Daldy, who suggested that my opinion might be taken as to what had best be done. I found five external openings of sinuses, margined by granulations, and communicating with each other deeply under a surface of about two inches. The discharge from the sinuses was purulent, but thin, and the immediate neighborhood of the sinuses was massive and thickened. It appeared to me that a truss applied upon the skin overlying these deep sinuses, so as to force the granulating walls into contact, and to keep them in that state during a few weeks, might close these sinuses and obviate the suggested "laying them open." Such a truss as that I have shown you was then applied, and the patient permitted to walk about. The truss was worn day and night, and in a fortnight all the sinuses were firmly closed. After that time, the patient wore the truss during the daytime only for several weeks longer, until all the thickening and hardening of the soft parts had entirely disappeared.

The merits of "mechanical rest" are sufficiently obvious in this case. I may add that this patient had, a few months afterwards, a most severe and dangerous attack of double pneumonia, which invalided him for a long time, but the sinuses did not reopen.

The next case to which I will refer is that of a sinus under the tendons of the extensor muscles on the dorsum of the foot. This was the case of a young gentleman aged thirteen, who was brought to my house on the 11th of July, 1860. The sinus occurred after an abscess suspected to be associated with disease of the tarsal bones; it had existed off and on during four years, and he had been under the surgical treatment of an hospital surgeon irregularly during the whole time. Sometimes the sinus was discharging; then it would heal up; soon again become swollen; then break and discharge for a time, and so on. A probe passed easily along the sinus under the tendons of the long extensor for about two inches, the course of the sinus being indicated by considerable thickening of the areolar tissue. I could detect no disease of the tarsal bones by examination with the probe, or by pressing upon the heads of the metatarsal bones towards the tarsus. This latter method enables the surgeon to ascertain with precision which of the tarsal bones or articulations, if any,

are diseased. The patient's mother told me that on walking far the back of the foot became swollen and painful. I placed a thick pad of lint over the track of the sinus, leaving its opening free, and then applied a bandage over the whole of the foot, so as to coapt the sides of the sinus, a small aperture being left for the escape of discharge. Now it will appear almost ridiculous when I add that in four days the sinus was healed; but around the sinus there was a thick mass of consolidated structures adhering partly to the tendons and partly to the subjacent tissues. Here, I suspect, was the starting-point of defect in the treatment by the surgeon who preceded me. The new tissues filling up the sinus, or uniting the opposed granulations, were not strong enough and healthy enough to resist the traction of the tendons of the extensors or the movements of the foot. Looking on the case with this interpretation of the previous failure, I desired him to continue wearing the pad of lint and bandage for three or four months. The last time I saw him was on December 10th, 1860. The skin and subjacent tissues in the course of the old sinus were soft, and the areolar tissue was pliant and movable, allowing of the movements of the extensors, and apparently competent to the performance of its yielding and elastic duties. So the sinus remained perfectly well. Anxious that I might state nothing but the truth relating to this case, I wrote a note to this patient's father, who thus replied to me, May 7th, 1861:—"I have much pleasure in saying that my son's foot continues sound."

This is a good case, because the sinus was cured by "rest," as you may term it, in four days, after four years of unequal results. I think it also illustrates this wide but frequently disregarded principle, that new tissues are not competent to the same emergencies as those which are more thoroughly organized or advanced in life. The uniting medium of this freshly closed sinus was young at first, and I have no doubt, if I had allowed it to continue under the influence of these extensor tendons, it would have given way, and I should have had a repetition of the conditions which occurred to the other surgeons who had attended the case previously.

I shall be excused if I mention one more case, and then proceed to the other part of my subject. I adduced in my previous lecture some instances of ulcers and wounds which were very painful in consequence of the exposure of the ends of the nerves in the wounds—cases in which the pain was stopped by division of the nerve just below the surface of the wound. Two or three cases of that kind have since occurred at Guy's Hospital under my care, in which I have pursued the plan of dividing the nerve exposed in the wound. One case, that of a man aged twenty-eight, who had his finger crushed by accident, presented itself very recently. He was admitted last March, with a severely contused and lacerated index finger. An attempt was made to save the finger, but it was ultimately thought right to amputate it, just above the head of the first phalanx, by two lateral flaps of soft parts. The flaps assumed an unhealthy character, and the man was brought into the hospital. The sutures were removed, and the flaps fell widely apart. They were extremely painful, the agony of the man's feelings being expressed by his features in the clearest manner. He was scarcely ever free from pain, except under the narcotizing influence of large doses of opium. Upon the exposure of the flaps I detected the precise position of the exquisitely sensitive points in the granulations, and I passed a pointed bistoury under the course of the nerve within the flap and divided it, and my dresser

divided the other nerve in the same way in the other flap. It is not too much to say that the man was immediately freed from pain. From that time he suffered no pain and required no opium. The flaps became less swollen and inflamed, and in ten days, the granulations being then healthy, they were nicely adjusted, and the man got perfectly and quickly well.

I cannot avoid encroaching upon your time for a moment in order to relate another case, which comes from a professional friend, Mr. May, of Reading, who wrote to me on the 12th of December, 1860, as follows:—

"My dear Sir,—I cannot resist the temptation to tell you a case which offers a striking illustration of the principle so admirably explained and enforced in your lectures at the College of Surgeons, and for which our profession is deeply indebted.

"Nearly twenty years since, I attended a lady, who, for eight or nine years, had been afflicted with intense headache and intolerance of light, commencing on first awaking in the morning, and persisting more or less all day, totally disabling her, and, during many months, confining her entirely to her house.

"I learned that she had consulted several medical gentlemen, both in London and the provinces. Under an impression of inflammatory mischief in the brain, Dr. Marshall Hall ordered her a scalp issue with twenty peas, which was prolonged for some weeks; she underwent a long course of mercury, was cupped many times, blistered, &c., &c. Under other advice, she took tonic medicines of various kinds, and made a journey on the Rhine, &c. All seemed useless, and she had resigned herself to despair.

"At my first examination of the case, I learned that a severe frown was caused by the first influx of light in the morning; then followed headache, &c. My impression was, that if I could arrest this spasmodic action (by physiological rest?), and break the habit of return by mechanical means, I should prevent the other symptoms; and so it happened. I merely covered one eye with a card, about the size of a crown piece, and attached an elastic tape to it, so that it passed around the head, across the forehead, and over one eye, slightly compressing the occipito-frontalis and corrugators. This simple device effectually prevented the frown, and there was at once an end to the mischief.

"The only further treatment required was to gradually accustom the eyes to light and action; and this was readily done by using one at a time for two hours, and then changing the card to the other eye, regulating the admission of light. In other, but still more expressive words, I gave 'rest to parts' morbidly excited; and so this most terrible malady vanished as a charm.

"The patient continued free from the complaint during the remainder of her life, and died about two years ago."

"Believe me, dear Sir, yours most faithfully,

"George May.

Here was an important recognition of the principle of "Physiological Rest," which seems to have been applied very delicately and neatly to the relief of the persistent and painful symptoms experienced by this lady.

I shall now venture to direct your attention to an arrangement of nervous distribution, which has supplied, to my mind, during more than a

quarter of a century, and still supplies, a noticeable instance of design, which has not been, so far as I know, generally recognized or properly appreciated.

It is my purpose to devote a part of these lectures to the consideration of the influence of Rest in the treatment of diseased joints. In anticipation of those facts which will make manifest the importance of rest in treating diseased joints, and for the purpose of showing the physiological and fundamental principles on which it is based, I am desirous of placing before you some details of healthy human anatomy, regarding the general distribution of the nerves to the joints, and the associated muscular apparatus moving those joints, which bespeak special design.

I believe we can scarcely attach too much importance to the study of the simple, but exact, anatomy of this nervous distribution, which I hope to render intelligible and practically useful. I know that it is not only capable of accounting for morbid sympathies and pathological conditions requiring close and deep attention for their elucidation, but that, if properly applied, it will suggest and point out the true principle of treating such morbid states, based, as that treatment should be, on the anatomical and physiological considerations which will enlarge and enhance our appreciation of the beneficial influence of mechanical and physiological rest.

If surgeons will keep this monitory principle of Nature foremost in their professional thoughts, they will, under its guidance, become not only more convinced of its truth, but will make it more frequently the groundwork of legitimate treatment in cases of accident or disease.

I may now remind you that when a joint becomes inflamed, it is painful and difficult of movement; it becomes involuntarily fixed by Nature's own process, thus securing comparative rest to the interior of the joint. Indeed, we may lay it down as an axiom, that Nature instinctively renders an inflamed joint comparatively fixed and flexed. Now, what is the key to the explanation of the flexed position and rigid state of an inflamed joint? Some might say, "Because the patient finds it the easiest position for himself, and the easiest position must, of course, be the best." But this is no answer to the question, How is this position induced? It is not voluntary. The patient cannot either prevent it or change it when it exists; nay, more, it is not true that the flexed position is the easiest; for every day's experience declares the contrary. I shall hope to have the opportunity of showing you distinctly that, when the hip-joint is diseased, it is flexed, and is often in a very painful state; but that when the femur is put straight, so that the flexed condition is destroyed, the patient from that time is free from pain. Here is an instance in direct contradiction to the idea that the flexed condition is the easiest for the patient. When the joint is made straight, the patient experiences, almost immediately, a diminution of pain. It is true, however, that, in the case of the knee-joint, it is sometimes otherwise. It is plain that when the femur, tibia, and patella are in the position caused by the leg being in a state of extension, there must be a much larger extent of articular surface coaptation than in any other position of the joint. This surface coaptation becomes more and more reduced, or lessened in extent, as the tibia is carried backwards away from the femur. Probably, it is this diminution in the extent of the articular surface contact, as well as the diminished pressure, which explains the feeling of comfort that patients sometimes experience when the inflamed knee-joint is allowed to become flexed.

Still the question comes back to us, Why is an inflamed joint fixed and flexed? It appears to me to result from the circumstances to which

I shall presently allude more in detail—viz.: that the irritated or inflamed condition of the interior of the joint (say the knee-joint), involving the whole of the *articular nerves*, excites a corresponding condition of irritation in the same nervous trunks which supply both sets of muscles, extensors and flexors; but that the flexors, by virtue of their superior strength, compel the limb to obey *them*, and so force the joint into its *flexed condition*. The joint then becomes rigid and flexed, because the same nerves which supply the interior of the joint supply the muscles also which move the joint.

This anatomical arrangement, physiologically considered and rightly interpreted, may be made the means of explaining some of the most prominent symptoms of joint diseases, and of constituting a foundation for the required treatment of diseased joints by rest, which I propose to advance and to recommend.

In order to bring in a comprehensive and definite form before you this fact, which is so important on anatomical, physiological, and pathological grounds, I will state it thus: "*The same trunks of nerves whose branches supply the groups of muscles moving a joint furnish also a distribution of nerves to the skin over the insertions of the same muscles; and—what at this moment more especially merits our attention—the interior of the joint receives its nerves from the same source.*" This implies an accurate and consentaneous physiological harmony in these various co-operating structures.

For instance, the circumflex nerve supplies the teres minor and the deltoid muscles, the skin over the deltoid, and also the skin over the fascia of the upper arm, into which the deltoid muscle is partly inserted. It also gives an articular branch to the shoulder-joint. Other nerves go to that joint, such as a branch from the subscapular trunk, which is derived from almost precisely the same part of the axillary plexus as the circumflex nerve. The suprascapular nerve, after supplying the supraspinatus and infraspinatus muscles, sends little filaments to the interior of the same joint. Thus the same circumflex nerve supplies these muscles, the joint which the muscles move, and the skin over the muscles, as well as the skin over the fascia, which is a part of the insertion of the deltoid muscle. But here I touch upon a point, by which I am reminded to state that every fascia of the body has a muscle attached to it, and that every fascia throughout the body must be partly considered as the insertion of a muscle. I shall be able hereafter to trace nerves derived from the same trunk supplying the joint and muscle, and sometimes distributed over a large extent of fascia. That extent of nerve distribution, however, I shall show to have a very exact relation to the proportionate attachment of the muscles to the fascia, of which I shall be able to adduce some well-marked examples.

The object of such a distribution of nerves to the muscular and articular structures of a joint in accurate association is to insure mechanical and physiological consent between the external muscular or moving force, and the vital endurance of the parts moved, namely, of the joints, thus securing in health the true balance of force and friction until deterioration occurs. If this point of balance or adjustment be overreached during exertion, pain, Nature's warning prompter, is induced within the joint, and suggests the necessity of diminishing or arresting exertion. This cessation or this reduction of exercise, or friction and pressure upon the articular structures, *must be effected* by the muscular apparatus of the joint, either through the will, or immediately by its own instinctive efforts, called into play by means of the nervous association. The muscles, indeed,

appear to be told, through the medium of the nerves of the interior of the joint, that its articular structures are overtasked; and the antagonistic muscular forces of the joint being thus involuntarily excited, the joint is at once rendered rigid and stiff, for the purpose of keeping it at rest. Or it may be put in this way (only as confirmatory, however)—that the synovial membrane itself, under the influence of physiological exhaustion, contributes something towards the same end, by failing to secrete the proper quantity of synovial fluid. The joint thus robbed of its lubricating medium demands of the *exhausted muscles*, for its movement, a still greater effort than in its normal state; and their inability to respond to the extra demand necessitates the rest of the joint. Still, in this mode of viewing the subject, the necessity for limiting exertion, in order that the interior of the joint may obtain the rest requisite for the renewal of its physiological power and structural integrity, is intimated to the moving agents by the same nerve interpreters, and the moving agents, in obedience to the announcement, render the joint stiff and difficult of movement.

Without this nervous association in the muscular and articular structures, there could be no intimation, by the internal parts, of their exhausted function. There cannot be any doubt that it is when this period of functional exhaustion in the internal parts has been reached, and articular friction is nevertheless continued (notwithstanding the structural and functional prostration), that the mischief to the articular structures commences, and disease of the joints, as we term it, starts into existence.

Again, through the medium of this *muscular and cutaneous* nervous association, great security is given to the joint itself by those muscles being made aware of the point of contact of any extraneous force or violence. Their involuntary contraction instinctively makes the surrounding structures tense and rigid, and thus brings about an improved defence for the subjacent joint structures.

This same associated muscular and cutaneous nerve distribution is obviously of the highest importance in reference to the sense of touch. Thus in prehension, or grasping with the hand, the indication as to the amount of force to be employed must be the impression made upon the sensitive branches of the same nerve which supplies the muscles employed in the act of prehension or grasping. Hence the median nerves, with others, are employed in grasping, and also in the adaptation of the fingers to the palm of the hand. Whether the body to be grasped be great or small, there must be an instinctive limit to the grasping effort. This can only be indicated to the muscular apparatus employed by the sensitive nerves. I say, therefore, in prehension, the indicator as to the completion of the necessary force to be employed must be the impression made upon the sensitive branches of the same nerve which supplies the muscles employed in the act of prehension or grasping.

In standing, walking, or jumping, the contact of the skin of the foot with the ground intimates, in health, not only the degree of muscular force necessary to sustain the erect posture in standing, but gauges the use of the required energy in walking, and moderates the concussion of jumping. Without this normal, consentaneous muscular and sensitive function, precision of action would be lost, and unmeasured exercise of muscular force would be employed during the performance of any of these functions. The nice adjustment of muscular power must be an important thing, for we know that unexpected muscular force breaks the patella.

Let us now go to the bedside. Is it not indisputable that if we allow an inflamed knee-joint to lie upon a soft pillow, unconstrained by mechanical

means, the muscles of the joint, stimulated to undue exertion, never allow the articular surfaces to be kept quietly in apposition with each other? This explains the fixed and flexed condition of the joint. Thus the flexors—as I have before remarked, the more powerful muscles—act unceasingly day and night, apparently without any rest, and especially declare their mischievous assiduity by the wakeful slumbers and disturbed sleep of the patient. This persistent action of the flexors slowly alters the relation of the articular surfaces of the bones to each other—more slowly, indeed, but not less surely, than the hour-hand of the clock, which does not appear to move, but yet, if I compare its present position with that which it occupied some time since, I perceive that it has gone on marking the course of time.

Let us take for example the case of the knee-joint. The surgeon sees an inflamed and swollen joint, lying on its outer side, and desires that it may be kept quiet upon the bed, or on a soft pillow. Whether he sees it again in a few hours, or days, or in a week, the first thing that strikes him with regret, and perhaps surprise, is the changed position of the bones. He sees that the knee-joint is considerably more flexed than when he last saw it. On inquiry, he ascertains that neither the patient nor the nurse has disturbed it, and then he recognizes that the stealthy and mischievous flexors have secretly effected this change in position. It is merely flexion, under the influence of muscular energy involuntarily exerted; for as soon as muscular contraction is destroyed by chloroform, the fixed and flexed conditions of the joint are for the time entirely lost. And here I may state, that over and over again I have seen the mischievous and destructive effect of this increasing state of flexion of the joint; resulting, not seldom, I may say, from procrastination, or inexcusable want of courage on the part of the surgeon to rectify it, or from his yielding too easily to the importunities of the patient or his friends, in order to avoid giving pain to the patient. From the time when the limb begins to be flexed starts the mischief, which by-and-by cannot be controlled.

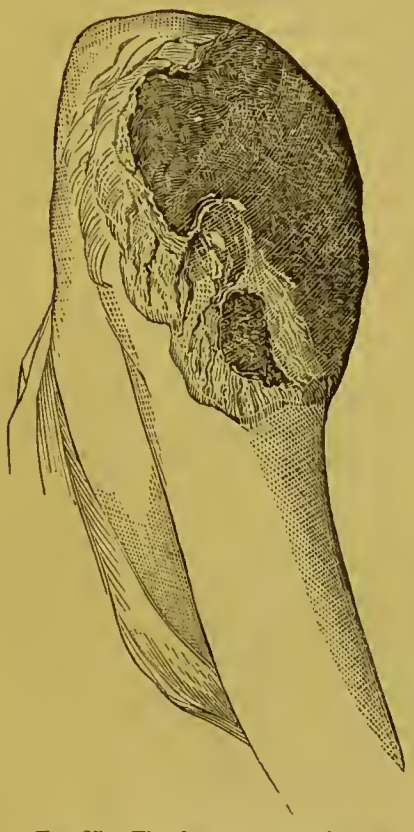


Fig. 25.—The large granulating surface, here very roughly delineated, was the sequel of severe local inflammation and superficial sloughing, resulting from the application of some irritating liquid by a quack to cure the disease of the joint.

I have here a drawing from nature (Fig. 25) to show to what extent flexion is sometimes involuntarily carried. You see the tibia flexed upon the femur at a very acute angle. This was originally a case of inflammation beginning in the interior of the knee-joint, and the contraction of the muscles was never resisted in the slightest degree, but was allowed to take its own course, and you see the result.

Fig. 26 represents another case of diseased knee-joint, in which the tibia and fibula were carried backwards, so that the heel touched the tuberosity of the ischium.

These are extreme specimens of the results of the absence of mechani-

cal constraint, and I feel convinced that the starting-point of the mischief which ultimately led to this condition, necessitating the amputation of these limbs, might have been successfully combated by placing a splint behind the knee-joint, thus counteracting the influence of the powerful flexors. I may add, both patients did well after amputation. It seems to me that it is a great mistake on the part of professional men, when they see an inflamed knee or other joint beginning to be contracted or flexed, not to correct it at once, and so avert the condition which led to the necessity for amputation in these two cases, at all events.

This explanation of the sole cause of fixed and flexed joints applies particularly to recently inflamed joints, before the deposition of new and comparatively solid material has taken place around and within the articulation. In cases of long-continued or chronic inflammation of joints, the contraction and fixed condition depend partly, no doubt, on the incumbrance of the joints by the new material. Hence the deformity of the joint at that period cannot be entirely removed even under the influence of chloroform.

Permit me just again to refer to this constantly flexed state of an inflamed joint. Take, for example, that of the hip: I venture to say that no gentleman here ever saw an inflamed hip-joint with the leg extended. It is uniformly bent, and also, as a rule, slightly adducted, the cause of which I shall have occasion to refer to at another time. In the case of the knee-joint, when inflamed it is always flexed. Curiously enough, the malingerer, wishing to deceive and to impose, almost always endeavors to indicate his long-continued and extreme suffering by fully extending the leg. But this extended position displays the imposition, for an inflamed joint is never straight, but always flexed, the degree of that flexed condition depending upon the intensity or the long duration of the mischief. Did any person ever see an inflamed ankle-joint, permitted to pursue its own course, remain nearly at a right angle with the foot? The heel is always raised by the gastrocnemii, and the toes pointed downward. An inflamed elbow-joint is always flexed, never extended. But when we come to the wrist-joint, we find that, although the muscular power associated with it is very great, yet in consequence of the extending and flexing forces being pretty equally balanced, we seldom have much flexion of the hand when the wrist-joint is inflamed. This is in strict accordance with the law which I have endeavored to place before you—the equality of muscular force not causing much disturbance of the bones, but simply maintaining the joint

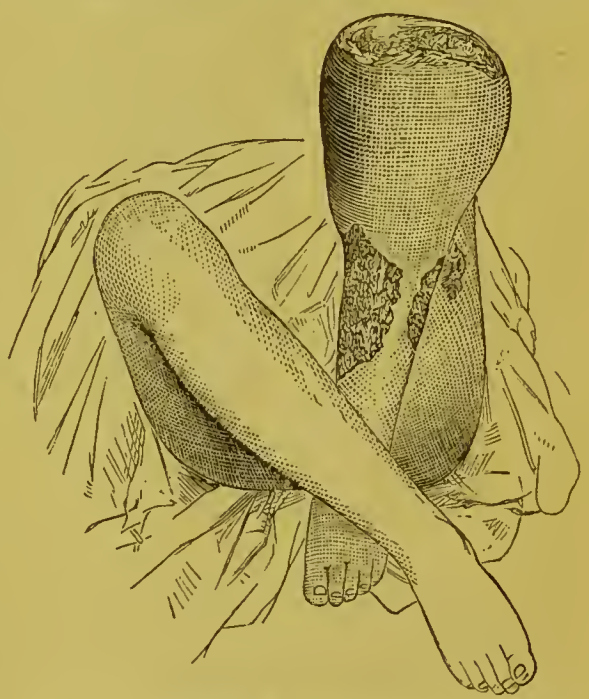


FIG. 26.—In this sketch, representing the child's state on admission into Guy's Hospital, the condyles of the femur are visible. They became denuded, and exposed some time before I saw the little patient. The ulceration of the skin was caused by the projecting condyles constantly pressing upon it, the patient being at that time in bad health.

in a quiet but fixed condition. Again, with regard to the fingers. Who ever saw a finger with an inflamed joint of any duration in which the finger was perfectly straight? Such a thing was never seen; the inflamed joint is always more or less bent under the influence of the flexors. I think that the degree of flexion associated with diseased joints in the hand is proportionate to the number of muscles and the nervous supply, on which I shall have occasion to dwell in my next lecture. The forefinger, for example, when inflamed, is generally not so much flexed as the others, because it has an additional muscle, the extensor indicis, which counteracts the tendency to become flexed. With regard to the thumb, as a rule, I should say it is not proportionately so much flexed towards the palm when inflamed as the middle or ring finger. The explanation is: that there is a greater balance of power in the muscles of the thumb, the flexors and extensors, as compared with the corresponding muscles of the fingers. This will account for the extreme flexed condition of some of the fingers, the slight degree of flexion of the forefinger, and the nearly straight condition frequently observed in an inflamed joint of the thumb.

LECTURE VIII.

Cutaneous Branch of the Musculo-Spiral Nerve—Precision of Nervous Supply to Muscles—Symptoms of Inflamed Joints and Treatment by Rest and External Anæsthetics—Examples of Physiological Rest—Musculo-Cutaneous Nerve of Upper Extremity—Bent Arm after Venesection—Cases of Injury to Musculo-Cutaneous Nerve—Nerves of Fingers, Toes, and Thumb—Effect of Pressure upon Spinal Nerves—Gangrene of Third and Fourth Fingers from Pressure on Ulnar Nerve.

Towards the conclusion of my last lecture, I made the statement,—that the same trunks of nerves, the branches of which supply the groups of muscles moving any joint, furnish also a distribution of nerves to the skin over the same muscles and their insertions, and (what at that time more especially merited our attention) that the interior of the joint receives its nerves from the same source. Hence arises an accurate, consentaneous, and physiological harmony in these various co-operating structures. I availed myself of this statement for the purpose of explaining how it happens that an inflamed joint is necessarily rigid and as necessarily flexed; and I explained, somewhat in detail, this method of tracing out the distribution of the nerves to the joints, to the skin, and to the muscles. I was in the habit of teaching this publicly at Guy's Hospital for upwards of twenty-five years. I did not expect that I should have occasion to refer to this fact at all, because I apprehended that after teaching at least three thousand students in Guy's Hospital it would be pretty well known, as the result of my public teaching. But I find amongst the excellent books published by the New Sydenham Society a work by Schrœder Van der Kolk, in which he states: "After I had, in the year 1847, detected a close connection between the peripheric distribution of the sensitive and motor nerves, by the discovery of a remarkable law of the course and distribution of sensitive nerves in the skin,—namely, that throughout the body the sensitive branches of a mixed nerve run to the part of the skin which is moved by the muscles receiving motor filaments from the same nerve trunk; so that, the action of the muscle being known, we can, according to this law, even *à priori*, define the distribution of the sensitive nerves in the skin."

Here you will observe is the same idea expressed by this gentleman in 1847. Now it so happens that one of my colleagues, Mr. Birkett, published a translation of a German book on Human Anatomy in the year 1846, in which reference is made to this very subject by the translator. He added within brackets the fact of the associated supply of nerves to muscles and skin, but without further notice; introducing it in the same way in which it had been habitually treated by myself in public lectures at Guy's Hospital during many previous years. He so introduced it no doubt for the purpose of marking an advance of our knowledge in that respect beyond that of the German original. I have therefore no hesitation in claiming the anticipation, or priority if we may so term it, in the observation and expression of the facts here alluded to by Schrœder Van der Kolk as a discovery of his own. I do not know that this is a matter of any very great importance, but I suppose it right, in some measure at

any rate, to maintain one's own position. It is not necessary to criticise the statements made by Van der Kolk, because what I have done at Guy's Hospital, long before they were published, has taken a much wider and more extended view of the subject than that presented in his book.

To proceed with our subject, however. This articular, muscular, and cutaneous or peripheral distribution of the nerves is, in my opinion, a uniform arrangement in every joint of the body. We may find numerous illustrations of the same method of distribution in other parts of the body which have the same definite relation to each other, and in this respect present the same physiological and mechanical arrangement observable in ordinary joints, to which I shall hereafter refer. For instance, I shall endeavor to show that this same principle of arrangement, anatomically, physiologically, and pathologically considered, is to be observed, with an equal degree of accuracy, in the serous and in the mucous membranes. Thus considered, it manifests a wide principle, which, if it has any application in practice, must be one certainly of large extent. I shall endeavor to show that this is really its true position.

I may now, for a moment, refer to another diagram (Fig. 27), for the purpose of confirming the proposition that the same nerves that supply the muscles supply the joints, and also the skin over the muscles. The *musculo-spiral nerve* supplies certain muscles very definitely, and none others—these are the extensors of the elbow-joint, of the wrist, of the fingers and thumb, and the supinators of the radio-ulnar articulations. It also supplies the skin over all these muscles, and the joints which they move; and this is the whole of its distribution. Its cutaneous portion is accurately drawn in the diagram as far as it is exposed. This diagram (Fig. 27) clearly gives expression to what I shall hereafter allude to more in detail with respect to this musculo-spiral nerve—the precision of nervous supply to muscles.

Precision of Nervous Supply to Muscles.

The great precision with which muscles are supplied by their nerves is worthy of remark; and is such that if we have before us a contracted muscle, or a spasmodic condition of a muscle, we may be sure of the nerve which must be the medium, or the direct cause of it. Thus we see the teres minor lying in contact with the infraspinatus, yet never, as far as I know, receiving a branch from the suprascapular nerve. We may notice the four muscles placed between the os hyoides and the lower jaw : all four are usually considered as forming one group, but when you consider them with reference to their nervous supply they are entirely separable. The mylo-hyoid and the anterior belly of the digastric receive their nerves from the mylo-hyoid branch of the third division of the fifth, thus pointing accurately to the strict association between these muscles and the process of mastication. But looking to the genio-hyoideus and the genio-hyoglossus, we see that they are supplied by the hypoglossal; hence we must conclude that they are functionally associated with the movements of the tongue. And here let me observe to the rising generation of anatomists (who will, I hope, excuse my referring to such points), that I have always found anatomical lectures very much increased in interest and utility by pointing out the functional association and the physiological relation of muscles by their nervous supply, rather than by their mechanical relation to the bones.

There are some muscles that receive two nerves; thus, for example,

the adductor magnus of the thigh receives its nervous supply partly from the obturator and partly from the great sciatic; clearly indicating that the adductor magnus is associated in action partly with the adductor muscles and partly with the muscles at the back of the thigh, involving the idea of a double functional association.

In studying the supply of nerves to muscles, over every part of the body, we find a great degree of precision, which marks one difference between their distribution and that of the arteries. Thus, if we look to the omo-hyoideus muscle, we find that it receives its nerves from three sources: it has a branch from the hypoglossal, and if you trace that branch upwards, you find it receives a filament from the pneumogastric nerve, and there are other filaments to the muscle from the cervical plexus. This clearly points out that this muscle has three distinct functional associations — one in connection with the hypoglossal and the movements of the tongue, which it aids by fixing the hyoid bone; another connected with the pneumogastric nerve, so as to bring it into association with the process of respiration; and a third to associate it with the movement of the muscles of the neck.

I make these remarks for the purpose of pointing out that there is a remarkable precision in the supply of nerves to the muscles. These examples are taken from small muscles, but they stand out distinctly, especially the omo-hyoid, not so much from their size as from the precision of the demonstration. This muscle arises from the superior edge of the scapula, close to what we call the suprascapular notch, and in close proximity with the suprascapular nerve. If it had been a matter of no importance as to what nerve should supply the omo-hyoid, there is a nerve close at hand ready to do this; but I believe it was never seen, that the suprascapular nerve sent a filament to the omo-hyoid. The facts before you express clearly, that the muscles receive their appropriate nerves in a very decided and definite manner.



Fig. 27. — Cutaneous branch of the musculo-spiral (extensor and supinator) nerve supplying the skin of the lower third of upper arm over the triceps, and the whole of the dorsal aspect of the forearm.

The precision and accuracy of the nervous supply to muscles are shown not only by each muscle receiving a definite nerve, but also by its receiving it in a definite way. As a rule, nerves enter the muscles where they would be most secure from pressure, and it is curious to observe how careful Nature has been in this respect to guard one of the most important nerves of the body. The phrenic nerves (our lives hang on these threads), after passing through the chest, traverse the diaphragm, and distribute their branches upon the *under* surface of the muscle, and are so situated that they cannot be compressed during respiration. If they were distributed upon the upper surface of the diaphragm, where there is a constant and forced contact between the base of the lung and the superior aspect of the diaphragm, and especially so during a retained inspiration, it is obvious that these filaments of the phrenic nerve would under such circumstances be exposed or subjected to compression, and the action of the diaphragm would be dangerously interfered with. The nerves, however, are distributed on the under or concave surface of the diaphragm; the whole ten-

dency of gravitation being to remove the liver, the stomach, and the spleen away from them, so as to enable the nerves to carry their influence to the diaphragm unmolested.

Symptoms of Inflamed Joints, and Treatment by Rest and External Anæsthetics.

I will remind you, that when the shoulder-joint is inflamed it is fixed. I apprehend that that condition occurs from this fact: *when the interior of the joint is in a state of inflammation or of irritation, the influence of this condition is carried to the spinal marrow, and thence reflected to the various muscles of the joint, through the medium of the associated motor nerves, the muscles being supplied by the same nerves that supply the interior of the joint.* A fixed position is thus produced; for undoubtedly, as I remarked the other day, if you give such a patient chloroform, you destroy the fixed condition, and the joint is perfectly movable by the hand of the surgeon. Again, in the case of inflamed shoulder-joint, the skin over the shoulder is very sensitive. Perhaps not immediately, but in a short time—in a day or two—there is pain over the cutaneous distribution of the circumflex nerve, and not unfrequently considerable pain at the back of the shoulder. You will recollect that the same trunks of nerves which form the circumflex nerve transmit some posterior filaments to the skin over the shoulder and the lower part of the neck; hence the pain experienced in this region by patients suffering from disease in the shoulder-joint.

Now, upon what principle should we treat the inflammation of a joint? In answer to this general inquiry, I would especially refer to the shoulder-joint, because it is so simple in its anatomical arrangement, that I can the more easily apply these practical remarks. I should say, in aid of other means, employ this cutaneous distribution of nerves as a road or means towards relieving pain and irritation within the joint. You thus quiet the muscles, prevent extreme friction, and reduce muscular pressure and spasm. Therapeutics may certainly reach the interior of this joint, and its muscles, through the medium of the nerves upon the surface of the skin, and so induce physiological rest to all the parts concerned in moving the joint. I mean to say that, these nerves upon the surface of the skin being in direct association with the interior of the joint itself, we may reduce the muscular spasm as well as the sensibility of the interior portion of the joint, by applying our anæsthetics with accuracy and with sufficient intensity upon the exterior of the deltoid muscle, over the distribution of these sensitive filaments. The thought will occur to you at once that there is nothing very remarkable in this opinion, and that is quite true. The embrocations, however, which would ordinarily be suggested for this purpose are not of a character sufficiently potent to alleviate the pain of the patient, and are, I believe, seldom employed with a definite idea in the mind of the prescriber. I would suggest that we should employ our fomentations strongly medicated with belladonna, with opium, or with hemlock, instead of using mere fomentations of hot water. Some will say, "Oh, hot water is quite as good;" but I can assure you practically it is not so. The advantage to be derived arises in this way: the sensibility of the filaments supplying the skin being reduced, that influence is propagated through the sensitive nerves, to the interior of the joint, and to the muscles moving the joint. This diminution of sensibility tends to give quietude or perfect rest to the interior of the joint,

which is one of the most important elements towards the successful issue of the treatment of cases of this kind.

Examples of Physiological Rest.

Suppose you have a patient who is the subject of iritis. You drop sulphate of atropia upon the conjunctiva, and you act upon the iris; you see its influence upon the condition of the iris. How is this brought about? It must be through the medium of the impression made by atropine upon the sensitive filaments of the ophthalmic branches of the fifth nerve, which are distributed upon the conjunctiva. I cannot believe it to be by its direct transmission through the various and dense tissues covering and surrounding the iris; for we observe that exactly the same effect can be produced upon the iris by rubbing or smearing belladonna upon the eyebrows, forehead, and eyelids, which are supplied by the first division of the fifth nerve. If, then, admittedly, you influence the condition of the iris by dropping atropine upon the conjunctiva, which is supplied by the fifth nerve (the iris receiving its motor supply from the third and sympathetic nerves), why should you not succeed in relieving muscular spasm in the interior of a joint by narcotics, applied to the peripheral branches of the same nerve which supplies the muscles that move the joint? I feel confident that quacks oftentimes succeed in giving relief where legitimate surgery seems to fail; and they do it in this way: they employ the most potent means of counter-irritation in combination with anæsthetics, where we should use only an embrocation or infusion or a fomentation of comparatively little anæsthetic influence. These fellows employ potent remedies, and they succeed, without knowing how, where some of us, more legitimately circumstanced, actually fail.

Let us take another illustration. If we can, by introducing opium into the auditory canal, relieve toothache and a stiff jaw, do we not come to the same principle as that which stands before us in respect to the circumflex nerve and its cutaneous filaments? Last winter, during that very cold weather with sharp easterly winds, a gentleman called on me, and told me that whilst riding on horseback that morning down Highgate-hill, he was suddenly seized with stiff jaw and intense pain in his left ear, and he added, "I have been to my office, but in consequence of the pain in my ear I cannot do anything. I have endeavored to overcome the pain by sitting quietly in my warm office; but I cannot bear myself, and now I have the most exquisite sensitiveness and pain in the left ear, and I can hardly move my jaw." In order to relieve him, I employed the principle of physiological rest, which I have been advocating to-day. By my direction he introduced some cotton wool, soaked in the sedative solution of opium, into the auditory canal. As he had a good deal of throbbing pulsation in the head, and imaginary noises in the ear, I thought it would be as well to give him a calomel pill at night, and a purge in the morning, and I requested him to let me see him on the following day. When I saw him in the morning, he said, "I am much obliged to you for the medicine, but I have not taken it; for I had not put the opium into the passage of the ear a quarter of an hour before all my symptoms disappeared, and the jaw became free from pain and stiffness." I think, then, we may fairly deduce from this and like cases, that if we can remove muscular spasm of the jaw by putting anæsthetics upon a cutaneous branch of the fifth nerve which supplies those muscles, we may employ the same kind of remedies, with great advantage, in joint diseases. We may surely

expect to give great relief to the joint, by acting upon the cutaneous nerves of the same trunks which supply those muscles that are doing great harm by spasmodically moving it, or by pressing the inflamed articular surfaces upon each other.

Opium is injected into the rectum to relieve an irritable urinary bladder, or spasmodic stricture of the urethra. Is not the same principle involved here? In like manner we apply anæsthetics to the skin of the perineum to relieve retention of urine. Again, we find some patients with hip-joint disease suffering from pain in the knee. Now, although the disease does not lie there, we know that the pain can be relieved by a belladonna plaster, or strong hemlock poultices or fomentations applied over the knee-joint; thus acting upon the nerves of the hip-joint through the medium of those which are spread over the knee-joint.

There are some circumstances in which the circumflex nerve becomes injured and exceedingly painful, especially after dislocation of the humerus. In such cases, the patients experience a wasting of the deltoid, and suffer a great deal of pain in and about the shoulder. This, in part (sometimes, at any rate), depends upon the temporary pressure of the head of the humerus upon the nerve, or the stretching or tearing of the nerve at the time of the accident. Although the patient is disabled for a time, ultimately the pain disappears, the deltoid recovers its size, and the capability of the joint is restored. The same wasting of muscle and pain are manifested also, though not so satisfactorily explained, when the tendon of the biceps is ruptured; the deltoid becomes reduced in size, and the shoulder-joint suffers a great deal of pain, relieved by strong anæsthetics applied to the skin of the shoulder.

These points I now place before you as associated with the circumflex nerve; and I might repeat them with respect to the other joints and their nerves, but, as I should only be reiterating the same suggestions, I have selected the relation of the circumflex nerve as representing the type of the arrangement in joints generally, and have appended to it these practical reflections which have a very general bearing and a wide significance. I speak strongly upon this subject, because I have long been in the habit of acting upon it and of seeing its advantages. Of this I feel assured, that if the profession will act upon the cutaneous distribution of the nerves with determination and definite ideas, for the purpose of conveying a calming influence to the associated deep-seated muscular and articular or internal nerves, they will find the treatment very successful.

I now proceed to the examination of the distribution of the

External or Musculo-Cutaneous Nerve of the Upper Extremity.

The cutaneous portion of this nerve is very nicely shown in the diagram (Fig. 28). You see the nerve spreading its branches down the anterior and outer part of the forearm, nearly as far as the base of the radius. Now what is the object of this nerve? It is derived from the fifth, sixth, and seventh cervical nerves, and it has a well-defined distribution to the muscles, fascia, and skin. It goes to the coraco-brachialis, to the biceps, and then to the brachialis anticus, and thence sends a branch to the anterior part of the elbow-joint, thus displaying the articular association pointed out in the case of the circumflex nerve. The nerve now becomes subcutaneous, reflects a branch over the lower part of the biceps, and then prolongs numerous branches (at first sight apparently) far away from the muscles with which it is associated. You may first observe the

recurrent branch passing upwards to the skin over the lower part of the biceps. From the tendon of this muscle proceeds what is termed its fascial insertion. Now the fascia of the forearm is part of the insertion of the biceps—it is an essential part of it. Instead, therefore, of this musculo-cutaneous nerve departing from the arrangement to which I have referred, it substantiates it most completely, because it is distributed to the skin over the fascia which that muscle moves. And mark another association here: a part of the musculo-spiral nerve, as it ought to do, comes over the supinator radii longus, because that muscle is supplied by the musculo-spiral nerve. On the inner side, a portion of the internal cutaneous branch * of the median nerve should be seen, because the fascia on the inner side gives attachment to the pronator radii teres, the flexor carpi radialis, and the flexor carpi ulnaris. These muscles are supplied by the median nerve, and they arise from the fascia. When they contract, they can exert some influence upon the fascia: so that this fascia is, as it were, the common property of three nerves. Here, then, we have an arrangement of nerves which shows very distinctly the muscular, articular, and cutaneous branches all associated in one trunk. The attachment of the muscles to the fascia is no doubt the reason why we have sometimes such difficulty in treating injuries to the fascia. If we have to treat a large sub-fascial abscess, we all know the difficulty of healing it, in consequence of the fascia of the forearm being freely movable by muscles. Unless we can keep certain muscles quiet which at first sight might appear to have no relation to the abscess, we cannot succeed in our treatment. This is to be accomplished, however, by the employment of mechanical pressure by bandages, so as to coapt the internal surfaces of the abscess. We quiet the biceps and the muscles of the upper part of the arm by making pressure upon them, and so secure mechanical rest to the walls of the abscess.



FIG. 28.—*a*, Musculo-cutaneous nerve piercing the fascia of the arm just above the bend of the elbow to the outer side of the tendon of the biceps, and then distributing its branches to the skin of the lower part of the upper arm and the forearm, as far as the wrist-joint. —*b*, Branch of the musculo-spiral nerve supplying the skin along the outer edge of the arm, over the supinator longus.

I feel bound to place before you one or two facts associated with this nerve, bearing on the practice of our profession, because, if I should take up your time without showing you that some practical advantage was to be obtained, I should be asking you to make a sacrifice which would not be justifiable. We have here (Fig. 29) a drawing of a dissection made by myself many years ago, showing the superficial nerves and veins of the anterior part of the elbow-joint, and also the brachial artery and its accompanying veins. You see a part only of the external cutaneous nerve. The inner cutaneous

* By "the internal cutaneous branch of the median" is meant the internal cutaneous nerve itself, which takes origin from the eighth cervical and first dorsal nerves, in common with the inner head of the median, of which it may therefore be described as a cutaneous branch, supplying the skin over the fascial origin of muscles supplied by the median nerve.—[ED.]

filaments are seen, some traveling over and others under the different superficial veins.

Cause of Bent Arm after Venesection.

Formerly, when bleeding was a common operation (it is now a very rare one), patients used sometimes to suffer after, and as the result of, venesection, from what was termed a "bent arm." It was explained by supposing the fascia had been wounded during venesection; this supposition was adopted, because the fascia and tendon of the biceps stood prominently out, and forced themselves upon the attention of the surgeon. It seems clear to me that injury to the fascia is not the explanation. I would say, that in the venesection one of these little filaments of nerve was wounded. As the lancet is passing into the vein, the patient feels a very sharp, acute, electrifying pain running from the seat of injury into the upper arm, which then distributes itself upon the back of the neck or shoulders, indicating that something unusual has happened. Now, under these circumstances, what occurs? Almost always the wound is unhealthy: it suppurates, granulates, and becomes exceedingly painful, and there is subsequently a very coarse cicatrization. How is it that the arm becomes bent? The injured nerve is a branch of that trunk which supplies the biceps and brachialis anticus. The effect of the injury is carried upwards to the spinal marrow, and reflected along the motor filaments supplying the biceps and brachialis anticus, and thus produces a spasmodic contraction in them. This is really the cause of a "bent arm," which I accept in preference to the other interpretation, of a wound in the fascia.

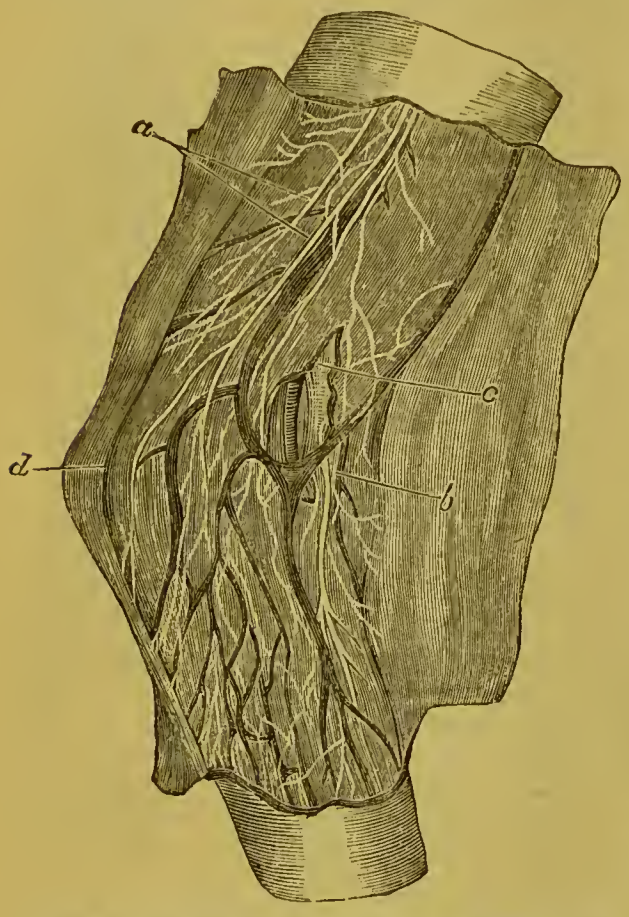


FIG. 29.—Veins and nerves at the bend of the elbow, from a dissection in reference to an occasional result of venesection. —*a*, Inner cutaneous nerves. *b*, External cutaneous nerve-branch of the same nerve which supplies the biceps and brachialis antieus. *c*, Opening made into the fascia to expose the brachial artery and its accompanying veins. *d*, Internal condyle of the humerus.

But this point may be carried a little further. It is nearly twenty years ago since I saw a patient who for several years had had a bent arm after venesection. I cut away the old cicatrix, which was very tender; small filaments of nerve were detected in the cicatrix, and from the time of the excision of the cicatrix the patient was free from "bent arm." This demonstrated to my mind, that the "bent arm" which followed venesection was not the result of a wound of the fascia, but of a wound

of one of the nerves supplying the muscles which are capable of bending the arm. Thus I have a right to say, that we can attach to these nerves points of practice which do not at first sight appear, when it is simply stated as a sort of axiom, that the same nerve that supplies the muscles supplies the skin over the insertion of those muscles.

Injury to the Musculo-Cutaneous Nerve by a Bullet.

I had once an excellent opportunity of seeing a well-marked case of injury to this musculo-cutaneous nerve. A lieutenant in the navy was at Lagos, fighting with the natives. He jumped ashore with his sword in his right hand, and ran with his men up to a stockade. Although he was struck once or twice, he went forward; presently his sword-arm dropped, he could grasp his sword in his hand with great vigor, but could not bend or raise his forearm. This gentleman, before he returned to his boat, received seven balls, of which some went through the right side of his chest. When I saw him in London, I removed a bullet from his leg, and he then explained to me the nature of the injury which he had received in his arm. This made one of the most precise experiments that you could possibly conceive upon the external cutaneous nerve. The bullet had bruised or severed the nerve, causing a paralysis of the biceps and brachialis anticus; both muscles were wasted, whilst the other muscles of the arm were well developed; a curious-looking depression was thus produced in the arm over the wasted muscles. In order to bend his right forearm, he used to place his left hand behind his right hand, and forcibly jerk the forearm into the flexed position. The sensibility of the skin over the ordinary distribution of the external cutaneous nerve was destroyed. He had consulted the late Mr. Guthrie as to giving up his appointment in the Service, and he subsequently came to me with the same object. I said I did not think the nerve had been divided. It might have been; there was no doubt it was seriously injured. I advised him, whether the nerve were divided or not, to retain his commission, as the probability was greatly in favor of its being ultimately repaired. He obtained leave of absence for two or three years, and wore his arm in a short sling. I met him three years afterwards in Piccadilly, when he flourished his stick in the air with his right arm, and said he was ready for anything. I asked him how long he had been getting well, and he told me, "About two years and a half." His arm was quite strong, and the wasted muscles had nearly regained their normal size. The power of grasping and moving the fingers which this gentleman retained after his injury, left no doubt that the median and ulnar nerves were uninjured. This was a well-defined injury, that marked very completely the distribution of the musculo-cutaneous nerve. This gentleman, as a captain in Her Majesty's Service, is now receiving his reward for his courage and his wounds.

Exostosis pressing upon the Musculo-Cutaneous Nerve.

I may mention another fact with regard to the same nerve. Four or five years ago a boy came to me at Guy's Hospital, with his arm contracted, and suffering a good deal of pain in the course of the external cutaneous nerve. On careful examination, I found a simple exostosis pressing upon this nerve as it passed through the coraco-brachialis muscle. He had several other similar exostoses at different parts of his body, but they did not pain him. I cut down upon the exostosis to which I

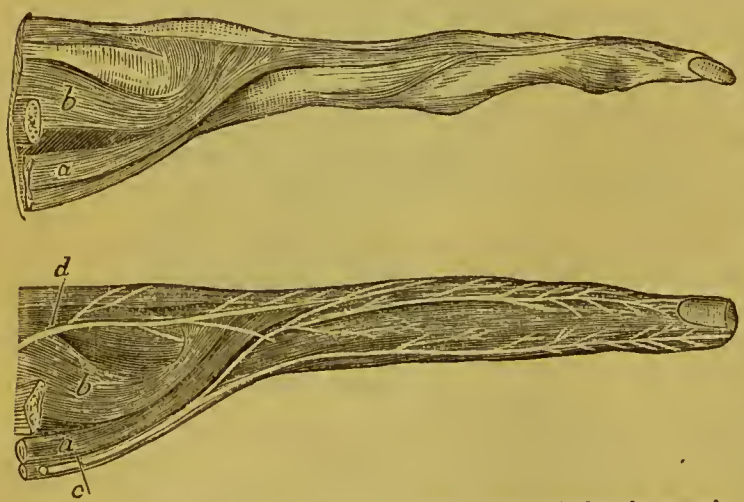
have specially referred, and removed it. He had no longer any pain, and was soon able to move his arm freely.

I think, then, we may assert that this external cutaneous nerve does manifest the law or principle of nervous distribution which I have endeavored to point out — that the same trunk of nerve which supplies the muscles, supplies the joints which move those muscles and the skin over the lengthened insertion in the fascia.

I am speaking in accordance with the experience of everybody when I say that an inflamed elbow-joint, permitted to take its own course, always becomes flexed under the influence of the biceps and brachialis anticus muscles; and I think we can understand why it should be so, from the distribution of the same nerve to the joint and muscles moving it. I think we may find some advantage in remembering what I have now pointed out with respect to the cutaneous nerves of the arm. I believe, also, that if strong anæsthetics were applied over the course of these cutaneous nerves, we should be entering upon a line of treatment which would ultimately influence the same nerves as they proceed to supply the different flexor muscles.

Distribution of Nerves to the Fingers.

The other two large nerves of the upper extremity are, the median and ulnar. I must not trouble you with much of the details of their distribution, except to point out its great precision. These nerves, together, supply all the flexors of the wrist-joint, fingers, and thumb, all the pronators of the radio-ulnar joints, and all the joints that those muscles move. The separate distribution of the median and the ulnar nerve I need not refer to, beyond reminding you of the fact. But when we come to look at this distribution closely, it is a little remarkable. We have here two middle fingers, drawn from nature: one with its muscles and tendons shown, and the other with the distribution of the nerves upon it. We see the tendons of the extensor running along the back of the finger, but scarcely further than the base of the second phalanx. Then by the side of the finger, and joined to the tendon of the extensors, we may see two small muscles—the lumbricalis and the interosseous. Their tendons pass on to the end of the finger, towards the dorsal aspect. Thus it might appear, at first sight, as if the



These two drawings, from nature, are intended to display the muscles and nerves of the middle finger.

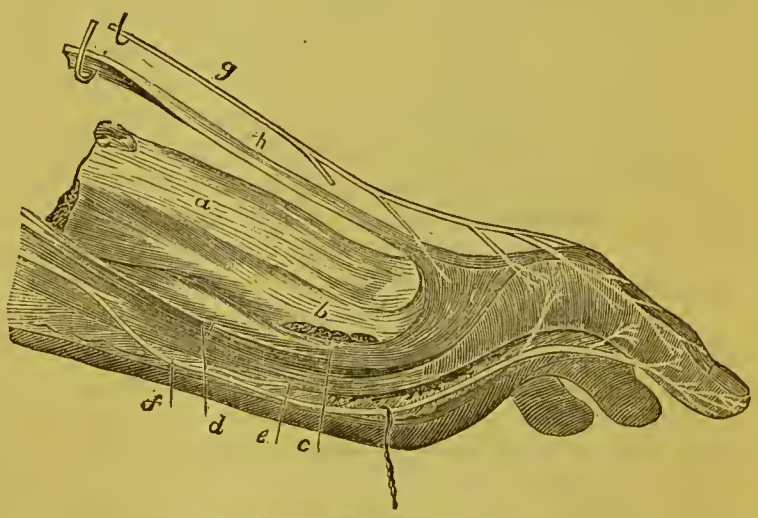
Fig. 30.—*a*. Lumbricalis with its tendon joining with the tendon of the long extensor, and thence proceeding to the last phalanx of the finger. *b*, Interosseous muscle and tendon inserted into tendon of long extensor.

Fig. 31.—*a* and *b*, the same as in Fig. 30. *c*, Digital branch of median nerve passing to the palmar surface of the finger, and sending a large and constant filament to join (*d*) a portion of the musculo-spiral nerve, and then proceeding along the dorsal aspect to the extremity of the finger.

flexor (median) nerve came on to the ground of an extensor distribution; but it is not really so, because the interossei and the lumbricales, which form a part of the flexor apparatus, are supplied by the median and ulnar nerves. We have here the tendons of these small muscles (supplied by flexor nerves) passing along the dorsum of the finger, in accordance with the distribution of the flexor nerves. We also observe a distinct portion of the extensor nerve running along the dorsum of the finger, as far as the tendons of the extensors proceed distinctly, and then uniting with the branch of the median nerve. So accurately is this systematic arrangement carried out in the median nerve, that these little muscles—the interosseous and the lumbricalis—command, as it were, an associated cutaneous nervous distribution. Hence this median nerve, whilst passing along underneath a portion of the finger, sends a large branch across the side of the second articulation, between the first and second bone of the finger, and distributes itself along the dorsum of the finger. Here again we have an instance of the same nerve supplying the muscles, and likewise the skin over the insertion of the same muscles.

Distribution of Nerves to the Toes.

Now contrast that state with the middle toe. You will observe the extensor tendons and nerves running along the dorsum of the toe. But here is a marked difference, apparently, in the distribution of the plantar nerve. Instead of there being a distinct dorsal branch from a plantar nerve, as you observe from the median or ulnar nerves in the hand, this plantar nerve (the analogue to the branch of the median nerve) does not pass towards the dorsum of the toe, but confines itself to its under surface; and it seems, upon careful examination, that the interossei and lumbricales do not extend themselves so completely along the dorsum of the toe as the corresponding muscles do upon the dorsum of the finger. Again we have, on a small scale, the same thing expressed with equal precision—that the same nerve that supplies the muscles supplies also the skin over the insertion of those muscles.



Middle toe, muscles and nerves.

FIG. 32.—*a*, Metatarsal bone. *b*, Interosseous muscle. *c*, Transversus pedis muscle. *d*, Lumbricalis. *e*, Flexor brevis digitorum. *f*, Plantar nerve (analogous to digital nerve of hand), but not supplying a distinct branch to the dorsum of the toe. *g*, Extensor nerve proceeding to the end of the toe. *h*, Extensor tendons.

Distribution of Nerves to the Thumb.

In this drawing of the human thumb (Fig. 33) you see a part of the distribution of the musculo-spiral nerve to which I have already alluded

as supplying all the extensors of the elbow, wrist, fingers, and thumb without exception, and none others except the radio-ulnar supinators.

Now the thumb stands in this peculiar position, that instead of having the tendons of its muscles blended together and merged into each other as in the fingers, making a sort of common ground for the distribution of two sets of nerves, you see the separate and distinct insertions of the tendons of the first, second, and third extensors of the thumb and the musculo-spiral (extensor) nerve going exclusively to it on the dorsal aspect of the thumb. There is no branch of the median nerve proceeding to the dorsum of the thumb, but there is a branch of it going to the dorsum of the finger. Why this difference? It is obvious that the whole of the muscular association on the dorsum of the thumb is confined to these three extensor tendons, all of which are supplied exclusively by the musculo-spiral or extensor nerve. In accordance with this arrangement, the same trunk—the musculo-spiral nerve—is the only one that supplies the skin over the dorsum of the thumb, thus making a marked difference in the cutaneous distribution of the thumb and the fingers. This arrangement is also subservient to the rule or law which I have mentioned, that the same nerve which supplies the muscles supplies the skin over the insertion of those muscles; it is an example on a small scale of the distribution, but it could scarcely be more exact.

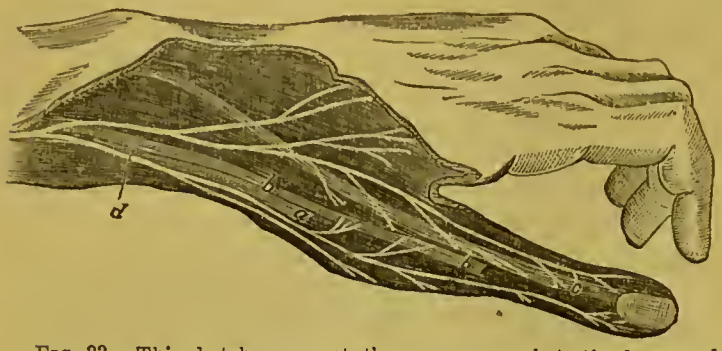


Fig. 33.—This sketch represents the nervous supply to the dorsum of the thumb, there being no palmar branch from the median nerve upon the dorsum of the thumb. *a*, *b*, *c*, The tendons of the three extensor muscles of the thumb. d, Portion of musculo-spiral nerve, *i.e.* radial nerve.

Even this little piece of anatomy may be occasionally of direct importance. I remember seeing an error completely checked by its recognition. A patient was suffering from tetanus, having a wound upon the dorsum of the finger over the third phalanx. The surgeon proposed to divide the nerve which supplies that part, and intended to divide the musculo-spiral nerve. That would have been an error. The musculo-spiral nerve does not supply that part exclusively; it is supplied partly, if not chiefly, from the median nerve.

Cases illustrating the Effect of Pressure upon Spinal Nerves.

I will now for a moment refer to illustrations of the effect of mechanical pressure or irritation upon the median nerve. We know that a fracture near the base of the radius, with displacement, is sometimes followed by a large amount of callus, that callus being always in proportion to the disturbance of the parts or severity of the fracture, and is occasionally due perhaps to the want of proper management. The swelling and displacement together lead to pressure upon the median nerve, and that pressure may produce destruction of the tissues at the peripheral distribution of the nerve.

Some years ago a sailor came to Guy's Hospital, under the care of the late Mr. Key, having had a bad fracture of the lower part of the radius. There was no surgeon on board the ship; the fracture was not properly

set, and in consequence the callus pressed severely upon the median nerve above the wrist. The man had ulceration of the skin upon the thumb, the forefinger, and the middle finger. The hand was purposely flexed, and put in such a position that all the tension was taken off the median nerve, and the ulceration got perfectly well ; but as soon as his hand was allowed to be freely used and extended again, and the pressure of the callus permitted to exert its influence upon the median nerve, the ulceration reappeared on the thumb, forefinger, and middle finger. He could not pursue his occupation as a sailor, but it was not thought right to submit him to any remedial operation, which might place his hand in danger, so he preferred remaining as he was. He was allowed to depart from the hospital, subject, no doubt, to a recurrence of the ulceration to which I have alluded. This is a good illustration of pressure upon a nerve producing deterioration of structure.

Gangrene of the Third and Fourth Fingers from Pressure upon the Ulnar Nerve.

I have placed this sketch (Fig. 34) before you for the purpose of illustrating a fact somewhat like the preceding. It shows gangrene of the little and of part of the third finger of the left hand. I will give you in a few words the history connected with it. Elizabeth B——, aged forty-seven, came under my care at Guy's Hospital in February, 1853. She was of healthy aspect and regular habits. About a year before, she felt numbness in the extremities of the third and fourth fingers of the left hand, with pain in the same parts, especially increased during the night. The fingers gradually became enfeebled and lessened in size. In a short time the ends of the above-named fingers began to appear discolored, while the numbness and pain increased. She had no particular treatment for this, and, as mortification was impending, the surgeon advised her to come to the hospital. On admission, the third and fourth fingers were found to be gangrenous, the extent of which is shown in the sketch. A healthy line of demarcation between the living and dead structures was then forming. No pulse was perceptible in the radial, and only a very slight one in the ulnar artery. On examining the case with care to ascertain the cause of all this, I found upon the first rib an exostosis pressing upon the subclavian artery so as to obliterate it, or prevent any blood from passing through it. The exostosis was pressing upon a nerve also, which turned out to be the ulnar nerve. I pressed my finger upon the nerve overlying the exostosis, and immediately the patient expressed additional pain in the little and adjoining fingers. The exostosis pressing upon the subclavian artery affected every part of the upper extremity alike, as far as the supply of blood was



Fig. 34.

concerned; but the additional circumstance was, that it pressed upon the ulnar nerve, and so produced a peculiar effect upon the two fingers supplied exclusively by the ulnar nerve. The interference with the nervous power or nervous influence, or the irritation of the nerve,* whatever it may be, led to structural deterioration, and finally to gangrene, of the ends of those fingers. The case is quite analogous to that of the sailor who received a fracture of the radius, with a large amount of callus pressing upon the median nerve, leading to ulceration of the forefinger, middle finger, and thumb; for the line of demarcation between ulceration and gangrene is but small: the one is molecular death—the other is local death, but on a larger scale.

* See note, p. 117, *ibique citat.*—[ED.]

LECTURE IX.

Pressure on Ulnar Nerve Producing Gangrene of the Third and Fourth Fingers—Furred Tongue on one Side Depending on a Decayed Tooth, Disease within the Cranium, and Fractured Base of the Skull—Decayed Molar Tooth Producing Gray Hair on the Temple—Excoriation of Auditory Canal and Enlarged Lymphatic Gland—Nervous Supply of the Wrist and Lower Extremities—Cause of Ulcers on the Legs being Frequently just above the Ankle—Distribution of Obturator Nerve—Cutaneous Nerves of the Knee—Explanation of Hysterical Pains in the Hip- or Knee-joint.

At the conclusion of my last lecture I was compelled abruptly to cut short the details of an interesting case of pressure upon the ulnar nerve, leading to gangrene of the third and fourth fingers. That, at least, was my interpretation of the case. Another question arises with respect to this case—Whether the exostosis, which was the source of pressure upon the subclavian artery and upon the ulnar nerve, subsided under the influence of the bichloride of mercury? The exostosis did undoubtedly diminish in size during the time the patient was in Guy's Hospital; but I have not seen her since that time.

I might have said, with respect to the details and the treatment of this case, that there was a very swollen condition of the left upper extremity, from pressure upon the artery, and, probably, the veins also. The arm was mottled in appearance, and its temperature much diminished, foreboding general gangrene of the limb. By the recumbent position of the body, with slight elevation of the arm, the return of the limb to a comparatively healthy state was very much facilitated and hastened, whilst the pain upon the ulnar nerve became greatly reduced. A large and thick layer of cotton wool was placed around the whole limb, and ultimately portions of the two fingers, which were actually gangrenous, entirely separated. The wounds healed up, and cicatrized healthily, and the patient went out of Guy's Hospital free from pain, and, as far as I know, perfectly well, except that the subclavian artery did not carry blood, nor was any pulsation to be felt in the radial artery, and scarcely any, if any, in the ulnar artery; but the mobility and temperature of the limb were nearly re-established. I might add, that there existed a small exostosis on the first rib of the right side of the chest, not so large as that on the left. Certainly both exostoses appeared to move with the first rib. I say, appeared to move with the rib, because there may be some surgeons who would question whether the exostoses were connected with the first rib, or with the transverse process of the seventh cervical or first dorsal vertebra. As far as I could tell, they appeared to be associated with the first rib. This instance of local gangrene is, I apprehend, an illustration of destruction of tissue from physiological disturbance and interference; that is, by pressure upon the ulnar nerve. If it could have been possible to remove that exostosis before the gangrenous ulceration took place, I believe that those fingers would not have been destroyed. This, then, will complete all I have to say on this case, which is one of great

interest; not so much from its own individual value, as that, in point of severity, it stands at the head of a group of cases on which I shall endeavor to enlarge. They constitute a class not generally referred to in books, though not unfrequently met with in practice, which have a very close relation to the subject of these lectures; I mean that of "physiological rest."

Within the last three months I was requested to see a young lady from the country on account of some painful symptoms she had in her right hand, especially in the little finger and the ring finger. Associated with these symptoms there was the suspicion of an aneurism of the right subclavian artery. I will not trouble you with all the particulars of this case, but only those which bear upon the suggestions before us. The patient had a slight, hard swelling upon the first rib, which her mother thought had resulted from a fracture that occurred in her childhood, she being now about nineteen years of age. The swelling had lifted up the subclavian artery very much, and gave it the appearance of unusual pulsation, and upon close examination a sort of aneurismal bruit could be heard, apparently the result of some enlargement encroaching upon the subclavian artery. There was really no aneurism. This was a case in point, where something had occurred to the first rib, possibly a fracture (of that I have my doubts, still it might have been so), which led to the pressure upon this ulnar nerve, and had caused the loss of sensation in the little and the adjoining finger, the loss of temperature in those two fingers especially, and very constant pain in them. These are, as far as I can see, the preliminary conditions of the previous case, which ultimately terminated in gangrene of the fingers. In the case of this young lady, we have only the evidence of deterioration having gone so far as to diminish both the size and the temperature of the fingers, and to produce considerable pain in them. What has been the issue of the case I do not know. It was, before I saw it, invested with a great degree of anxiety, on the part of both the patient and her friends, for they had received the impression that she had a subclavian aneurism, which would require a very serious, and no doubt to her mind a very dangerous, operation.



FIG. 35.—Sketch of a tongue furred only on the left side, resulting from a decayed and painful second molar tooth in the upper jaw on the same side of the head.

Furred Tongue on one side caused by a Decayed Tooth on the same side.

As I purpose making the case of gangrene of the fingers from pressure upon the ulnar nerve the starting-point of a little group of cases bearing upon the subject of physiological rest, or rather the evil resulting from the want of physiological rest to the nerves, I must request your attention to this sketch (Fig. 35) of a tongue furred on one side, and comparatively clean on the other. I dare say some of you at first sight wondered what this representation could be intended to elucidate, beyond the bare fact of one side being tolerably clean, and the other somewhat furred. Now,

this furred condition of the tongue, let me say in anticipation of what I have to speak of more in detail, is frequently associated with a diseased condition of the second and third divisions of the fifth nerve. It is, in fact, a functional and structural deterioration depending upon nervous influence,* in that respect very much resembling what we have already seen in an extreme condition in the case of gangrene of the fingers.

Furred Tongue on one side, depending on Disease within the Cranium.

The first time I had an opportunity of clearing up such a case as this occurred in 1843. On December 17th, 1843, I examined, with Mr. Blenkarne, a surgeon in the City, the body of one of his patients, who had died with disease of the brain and spine. She had suffered from intense pain on the left side of the head. She had also, during her life, a tongue furred on the left, and scarcely at all on the right side. It became, therefore, an important point to clear up what was the probable cause of that condition of the tongue. We made a post-mortem examination, and found, as was anticipated, a diseased spine. Then, upon very careful examination of the head, on turning up the dura mater from the anterior part of the petrous portion of the left temporal bone, for the especial purpose, we exposed the Gasserian ganglion, or the ganglion of the fifth nerve. We there found what might be called a scrofulous deposit upon the convex edge of this ganglion, involving the second division of the fifth nerve more than the third, but still involving all more or less. Here, then, appeared to us to be the probable explanation of the tongue furred on its left side. This observation was made in 1843; the disease was near the ganglion of the fifth nerve, and on the same side as the furred tongue. If I should not mention the fact again, it will be clearly understood that the diseased condition of the tooth, or of the fifth nerve, was always found on the same side as the furred tongue, and that the fur was confined to the anterior two-thirds of the upper surface of the tongue, over the distribution of the lingual gustatory nerve—a portion of the third division of the fifth.

* In other words, this condition of the fur is one of the effects which disturbance of the nerve force may produce on the nutrition of a part. It is well known that it is not merely defect, but disturbance, of nerve force which induces morbid nutrition. For a very clear account of this and numerous instances of the influence of the nervous system in nutrition, the reader is referred to Sir J. Paget's Surgical Pathology, lect. ii. He will find there, as instances of nerve influence on other epithelial tissues, a case of the hair growing quickly and temporarily white after nervous headache (cases in which the hair became permanently gray after mental anguish are well known), and a case quoted by the late Dr. Anstie (*Lancet*, June 16th, 1866), in which not only unilateral furring of the tongue followed, but also temporary unilateral blanching of the eyebrow and scalp, and also ulcers of the cornea.

Quite a different explanation has been put forward of this unilaterally furred condition of the tongue—viz. that the half of the jaw in which the diseased tooth is situated is but little used in mastication, and hence no removal of the epithelium of the tongue takes place by the friction of the food on that side.

Mr. Hilton informs me that since the delivery of these lectures he has had numerous other opportunities of observing the association of a unilaterally furred tongue with diseased molars in the upper or lower jaw. In the instances quoted above, the tongue was unilaterally furred over the distribution of the lingual gustatory to the anterior part of the tongue. I am able to state, on the authority of Mr. Hilton, that the posterior part only of the tongue (which receives its nerve supply from the glosso-pharyngeal) may sometimes be seen to be furred in cases of inflamed tonsil (which also receives branches from the glosso-pharyngeal nerve).—[Ed.]

In 1844, when delivering some lectures upon the nerves at Guy's Hospital, I mentioned this case, and one other that I had seen before, the cause of which I had not distinctly proved. After the lecture one of the students said, "Look at my tongue; it is furred on one side, and I cannot get rid of it." This sketch (Fig. 35) was taken from his tongue in 1844. He had a decayed and painful tooth—the second molar in the upper jaw. That tooth was, by my advice, removed, and after a short time the fur on the tongue entirely ceased. Now, in this case, as far as we could judge from these concurrent circumstances, we seemed to have a demonstration of the relation of probable cause and effect. Here was a painful and diseased second molar tooth in the upper jaw, on the same side as that on which the tongue was furred. This was apparently the cause of that condition; for, as soon as the tooth was removed, the fur on the tongue ceased, and the two sides became quickly alike.

Case of Fractured Base of the Skull, with Furred Tongue only on one side.

Some time afterwards a case of fracture of the skull was brought into Guy's Hospital, where the fracture ran across the foramen rotundum containing the second division of the fifth nerve. In that case the man had a furred tongue on the same side, indicating a probable relation of cause and effect.

When Mr. Bransby Cooper was alive, a gentleman was admitted into Guy's Hospital, who was believed to have fractured the base of his skull, and being anxious about the case, he requested Sir Benjamin Brodie to see him. That patient had a furred tongue on one side, and he had also indications, from the loss of sensation about the face, that the line of fracture interfered with the second division of the fifth nerve. He had a furred tongue on the same side as that which we supposed to be the seat of injury during the whole time he was in the hospital.

Furred Tongue on one side; Second Molar Tooth of Upper Jaw diseased.

Recently, a lady, whom I have known for some years, consulted me regarding some matters not of importance, and I, perhaps not for any very precise purpose, said, "Let me look at your tongue." She put out her tongue, and it was furred on one side. I said, "You have a bad tooth," and she thought it was exceedingly clever on my part. "Yes," she replied, "and I am going to Mr. Bell to have it taken out." She went and had it extracted; I saw her a fortnight afterwards, and all the fur had subsided. This was a second molar tooth in the upper jaw of the same side as the furred tongue.

Very recently my bootmaker had some little accident, and he came to my house to consult me. I found he had a furred tongue on the right side, and I remarked to him, "You have a decayed tooth in your upper jaw." "No," he said, "I have not; but I have had a bad tooth stopped, and it is very painful when I touch it in this way" (pressing his finger upon his cheek over the tooth); "almost ever since I had my tooth stopped my tongue has been like this."

Now these cases, taken together, and considered as a series or small group, seem strongly to suggest the influence of irritation or of pressure upon what we may call common spinal nerves, regarding the fifth nerve as

a common spinal nerve, although it has its relation only with the face and the head.

Gray Hair on the Temple depending on a Decayed Molar Tooth in the Lower Jaw on the same side.

A person was brought to me by a surgeon suffering very great pain on the left side of his face. He was much exposed to the weather, and suffered a great deal in consequence. He had taken many things to cure the neuralgia, as it was termed. I observed that he wore a wig, and I asked him the reason. He said, "Curiously enough, the hair on my left temple has all turned gray. I did not like to have black hair on one side and gray on the other, so I had my head shaved, and wear a wig." Upon examining his mouth, I found he had a decayed and painful molar tooth on the left side of the lower jaw—supplied by the third division of the fifth nerve. The patch of gray hair appeared to me to be the effect of the nervous association of the auriculo-temporal branch of this third division of the fifth nerve with the decayed tooth in the lower jaw. When this second molar tooth in the lower jaw was extracted the neuralgic pain very nearly ceased. I have not seen the patient since, and cannot say whether the hair has recovered its color. All I can say is, it was stated to me, that during the time he was suffering extreme pain on the left side the hair over the temporal region became nearly white: a difference in color suggesting to myself some structural deterioration, and to the patient the propriety of having his head shaved and wearing a wig.

Diseased Molar Tooth of the Lower Jaw producing Excoriation of the Auditory Canal on the same side, and an Enlarged Lymphatic Gland: cured by removal of the Tooth.

In a previous lecture I mentioned that a professional friend of mine had suffered from a condition which bears on the subject of the influence of nerves upon the structures supplied by them. That friend, unfortunately, is no more. It was Dr. Addison to whom this happened. The case is one of some interest, and I will repeat it in a few words. Some years ago Dr. Addison had a very offensive discharge from the auditory canal of one of his ears, which annoyed him very much; and below the external ear was a small gland enlarged in the upper part of the neck. He had tried various remedies for this discharge, and had gone, I believe, to some surgeons who attended specially to the ear, but, as far as I could learn, no good resulted from any of their applications. Upon examining the ear from which the offensive discharge proceeded, I found a slight ulceration upon the floor of the auditory canal. On arguing the question out between us, we came to the conclusion that the ulceration probably depended upon a diseased molar tooth in the lower jaw on the same side. We had that tooth extracted, and in a very short time the ulcer healed, the discharge and morbid secretion disappeared from the auditory canal, and as soon as that ulceration was cured the enlarged gland subsided. Here the true cause of error was remotely situated from one of the most prominent symptoms; namely, the enlarged gland in the upper part of the neck: in this respect the case is of great interest. This case adds another to the group of results of nervous disturbance which prove, as we have

seen, that irritation induced in a nerve, or pressure upon a nerve, is sufficient to lead to more or less change in function and structure, and that that morbid influence may after a time induce a deterioration resulting in, or sufficient to produce, a furred tongue, ulceration of skin, or gangrene of the fingers. In Dr. Addison's case there was an ulceration in the auditory canal, and the gland enlarged as the consequence of the exposed lymphatics absorbing and carrying the morbid fluid of the ulcer down to the lymphatic glands. Fortunately for us, these glands are highly conservative in their tendency, and they stop the progress of the morbid fluid in its onward course towards the circulation of the blood, where its damaging influence might be more diffused, and lead very frequently to the occurrence of the more serious condition which we are in the habit of calling by the general term pyæmia.

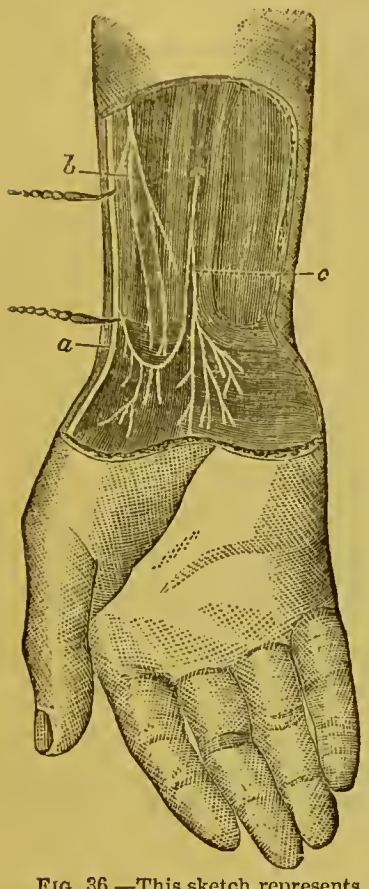


FIG. 36.—This sketch represents the nervous supply to the skin at the anterior and outer part of the wrist-joint, derived from three different trunks. *a*, A portion of the radial nerve. *b*, A portion of musculo-cutaneous nerve. *c*, Palmar branch of the median nerve.

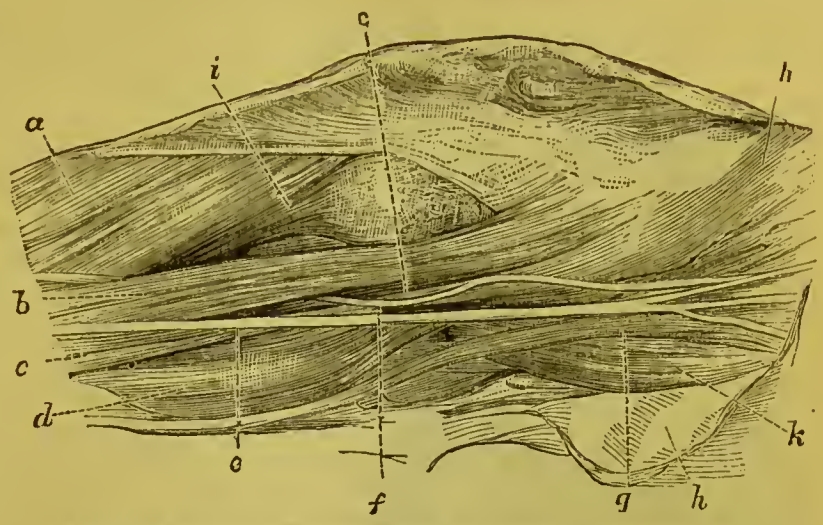
I thought I might be excused this digression, though I hardly think it requires an excuse, since it has enabled me to bring before you this very illustrative group of cases, which, as far as I know, have neither received due attention nor a right interpretation.

Before quitting the nerves of the upper extremity, I direct attention to this diagram (Fig. 36), taken from Mr. Swan's book on the Nerves. It shows the fascia covering certain tendons just above the wrist-joint, and you observe upon the fascia three nerves arising from three different sources. In truth, the fascia in this portion of the forearm may be said to be the common property of the muscles supplied with nerves derived from the median, the musculo-cutaneous, and the musculo-spiral nerves. The latter sends its branches over the tendons of the supinator radii longus, one of the muscles which this musculo-spiral nerve supplies. This example is a good illustration of the law that the same nerve which supplies the muscle supplies the skin over the insertion of the muscle. Here (Fig. 36) are three different muscular associations—the median nerve, supplying the flexors in front; the musculo-cutaneous, supplying the fascia, which is part of the insertion of the biceps; and the radial nerve, coming down to the outer side of the arm on its way to the dorsal aspect of the thumb, which it supplies exclusively.

Illustrations from Nerves of Lower Extremity.

In the lower extremity we discover the same law of nerve distribution as in the arm. For example, the anterior crural nerve supplies nearly all the muscles which we employ in the first effort of progression; we flex the thigh, we extend the knee, and we slightly evert the leg; and nearly all the muscles employed for those purposes—the psoas, the iliacus, pectineus, crureus, subcrureus, the two vasti, the rectus, and sartorius muscles—are

supplied by the anterior crural nerve. Not only are nearly all these muscles supplied by the anterior crural nerve, but so also is the skin over their insertion, as well as the joints which they move. We are all acquainted with the numerous cutaneous nerves (branches of the anterior crural) which supply the skin as far as the knee-joint, distributed over the thigh, including the external cutaneous nerve, and corresponding with the subjacent distribution of the anterior crural nerve to the various muscles. But from these various cutaneous nerves I must select the long saphenous, which pursues a peculiar course, and runs ahead (seemingly, at first sight, without purpose) of all the other nerves downwards as far as the ankle-joint and the side of the foot. I say, at first it appears extraordinary that this long saphenous nerve should run away from its comrades, and apparently from its proper muscular and cutaneous association, and proceed as far as the inner side of the foot; but when we come to examine this drawing, the thing is explained. Here is a sketch (Fig. 37), taken from a dissection, of the inner side of the knee. The sartorius (*b*) is seen to be most intimately and largely attached to the fascia of the leg (*h*); in truth, the fascia of this portion of the limb must be considered as part of the insertion of the sartorius, just as the fascia of the forearm is to be considered as part of the insertion of the biceps muscle. Not only is the sartorius supplied by the anterior crural nerve, but, as you will observe, the fascial insertion, extending down the leg some considerable distance, even as far as the ankle-joint, where it is blended with the fascia over the foot on the inner side of the inner malleolus, receives its nervous supply from the same source. This explains why the long saphenous nerve, which is derived from the anterior crural, should thrust itself through the fascia of the thigh, become subcutaneous, and then follow the course of the skin as far as the inner side of the ankle-joint, and sometimes as far as the inner side of the dorsal aspect of the foot, thus following the fascia. It appears a deviation from the natural order to find this anterior crural sending down branches to the leg as far as the foot; yet, when you come to examine this fascial association, you see that it is only carrying out the principle that the same nerve which supplies the muscle supplies the skin over the insertion of the muscle—the sartorius having a long fascial insertion as far as the point I have already indicated, and requiring an equally long nervous supply.



From a dissection of the inner side of the knee by G. A. Wright, B.A.

FIG. 37.—*a*, Vastus internus. *b*. Sartorius, inserted, in part, into the fascia of the leg. c c, Gracilis, inserted partly into the same fascia. *d*, Semi-membranosus. *e*, Internal saphenous vein. *f*, Long saphenous nerve. *g*. Tendon of semitendinosus, ending partly in, *h*, fascia of leg; one part of this fascia is left *in situ*, receiving part of the insertion of three muscles, part is turned down. *i*, Vertical and tendinous fibres of adductor magnus. *k*, Part of gastrocnemius muscle.

The anterior crural nerve sends branches also to the hip-joint. I have here a little sketch (Fig. 38) by Mr. Durham, of the nerves of the hip-joint, which has been taken from his notes of the various cases he met with in dissecting the nerves going to the capsular ligament of the hip-joint. I wish you to understand that these articular nerves are not copied directly from dissections, but are sketches made from different nerves, and grouped together to convey to you the idea of the supply of nerves to the hip-joint, although not with that precision of anatomy which, no doubt, is always desirable, and especially so within this college. We see filaments of the anterior crural nerve traced to the anterior part of the capsular ligament of the hip-joint; this nerve also sending branches to the muscles of the thigh, and to the capsular ligament of the knee-joint.

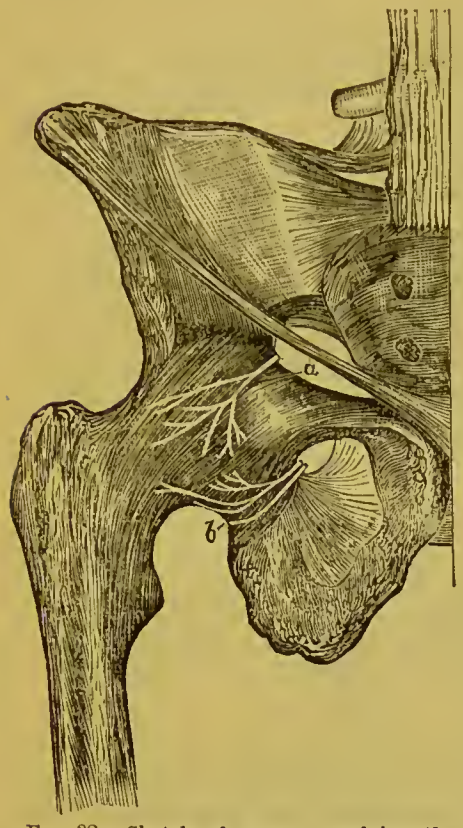


FIG. 38.—Sketch of nerves supplying the anterior and inner parts of the capsular ligament of the hip-joint. *a*, Filaments from the anterior crural nerve. *b*, Filaments from the obturator nerve.

Thus we see that the anterior crural nerve supplies the joints which its muscles move, the anterior part of the hip-joint, and a portion of the knee-joint; and it supplies the skin over the whole of the muscles of the thigh, as well as the skin on the inner side of the leg, as low down as the limits of the fascia to which is attached the sartorius muscle.

It is important, in tracing the nerves in this way, to fix upon them, as far as we can, some useful reference, so that we may not only bear them in mind, but see the practical application of the subject. Now, we know that the long saphenous nerve follows the course of the saphena major vein; and this is, no doubt, the explanation of patients experiencing so much pain in this neighborhood when these veins are dilated and press upon portions of the nerve. So, again, ulcerations on the lower and inner part of the leg, although small, are exquisitely painful—irritable, as we term them; and on some occasions I have been under the necessity of dividing the nerve in the ulcer, and that has led to its rapid healing—a point in respect of which I have addressed you two or three times before. The pain in the leg thus experienced is most manifest when the patient is standing, when all these veins are full of blood, and thereby encroaching upon the nerves; but if the leg be lifted up, and the blood-vessels so emptied, the pain is quickly relieved. It is pressure upon the nerve that causes the pain under those circumstances. I have very often recommended (with great advantage to the patients) elderly persons suffering from large veins, with or without sore legs, to raise the lower half of the bed on which they sleep in such a manner as to place the legs a little higher than the pelvis: the veins are thus empty nearly all the night, and the result is to remove the pressure; and if the patients are in bed about half the rest of their lives, Nature has an opportunity of repairing the injuries that have been inflicted. I have known many persons by this sim-

ple contrivance live in great comfort and freedom from the repetition of these small ulcers. The lower half of the bed being slightly elevated, whether the patient was asleep or awake, the legs were always lying on a slightly inclined plane; the venous blood then runs down easily to the neighborhood of the thigh, where it enters freely into the general circulation.

Cause of Ulcers on the Legs being so frequently situated just above the Ankle.

I would here ask a question, which I will endeavor to answer myself. Why is it that varicose ulcers occur so frequently at the inner and lower part of the leg? It might be said that they occur because the blood in the veins of the lower extremities has to run uphill, and gravitation interferes very much with the return of the blood; the valves become broken down, and the whole pressure, if we may so term it, is retrograde. If that were the sole reason, ulcers should occur by preference on the feet or on the toes, because these are more remote from the central circulation than the ordinary site of ulcers from varicose veins. Hence I suspect this cannot be the cause. The explanation has always—at least for some time past—appeared to me to be this:—The superficial and deep veins of the leg freely communicate with each other in the neighborhood of the ankle-joint. The first two inches above that point is the spot where the greatest stress is laid upon these superficial veins; below that point they freely communicate, and if the blood cannot return by the superficial veins, it can do so by the deep veins, or *vice versa*. But when you reach the point where that brown patch of skin so often occurs in old persons, above the inner malleolus, the anastomoses are less free, and this appears to me to be the reason why ulcers from varicose veins occur so frequently about that neighborhood.

To return, however, to the subject of nerve distribution. Formerly the muscles of the knee-joint were grouped in this way: ten muscles to the knee-joint—four extensors and six flexors—and they may be so now. Amongst the flexors were placed the sartorius, the gracilis, and the semi-tendinosus. Now I shall have occasion to show you presently that a better grouping of these muscles might be obtained; for we shall find, upon examination, that they do not receive their nerves from the same source, but each from a different one. Thus, the sartorius receives its nerve from the anterior crural nerve, the gracilis from the obturator or adductor nerve, and the semi-tendinosus from the great sciatic; thus clearly indicating the three different associations of those muscles. It is hardly fair, then, to group them as three of the flexors of the knee-joint. It is, in my opinion, better to look at them in their functional association, and then I think you will perceive a distinct indication that the sartorius, receiving its nerve exclusively from the anterior crural, is, in ordinary circumstances, associated with the other muscles supplied by the anterior crural. So with regard to the gracilis, it is supplied by the same nerve as that which supplies the adductor muscles; hence the gracilis should be called an adductor rather than a flexor muscle. Again, the semi-tendinosus receives its nerve exclusively from the great sciatic, which controls the flexors of the knee-joint. I shall have occasion almost immediately to allude to this more in detail.

Here is a beautiful diagram, or rather drawing (Fig. 39), of a recent dissection made for the purpose of displaying the course and distribu-

tion of the obturator nerve. The trunk of this nerve is seen coming out as usual of the vertebral canal, between the third and fourth lumbar vertebræ. I do not attach much importance to the point of exit, because you will remember that the spinal marrow ceases opposite the second lumbar vertebra; there is no marrow below that point in the adult, or long anterior to that period of life. But, keeping to the anatomy of the day, we say that the obturator nerve comes out between the third and fourth lumbar vertebræ, then passes down through the pelvis, and you will observe it in the drawing passing over the sacro-iliac articulation. I am disposed to think it sends some filaments to that articulation; at any rate, it lies close to it, and would be likely to suffer from its proximity to it when diseased. The nerve then passes down across the brim of the pelvis and along its inner aspect, then over the obturator internus muscle and through the obturator foramen (which in this drawing is exposed by cutting away part of the horizontal ramus of the pubic bone), where it throws a branch into the obturator externus muscle. The obturator nerve supplies this obturator muscle; then gives a filament to the capsular ligament; branches downwards to the notch of the acetabulum, and one filament to the hip-joint to be inserted into the base of the ligamentum teres. This explains those sympathetic pains associated with the hip-joint which manifest themselves at the knee-joint. Having sent branches to the capsular ligament and to the ligamentum teres, you see in the diagram the muscular distribution of this nerve; you see it supplying the obturator externus, and here the adductor brevis—not the pectineus, which is turned back as having no branch generally from the obturator, its chief supply being from the anterior crural, with an occasional branch from the accessory obturator when present. Here are filaments passing to the adductor longus and to the adductor magnus, and also to the gracilis. The muscular supply of this obturator is very precise to the obturator externus, the three adductors, and the gracilis. Then trace these two sensitive filaments: one passes down to the inner side of the knee-joint, and the other (a part of the posterior division) proceeds through the adductor magnus



FIG. 39.—This drawing represents nearly the whole of the distribution of the obturator nerve. *a*, Trunk of the obturator nerve. *b*, Articular branch proceeding through the popliteal space to the interior of the knee-joint. *c*, Cutaneous branch of the obturator nerve on its way to the inner side of the knee-joint; its terminal filaments may be seen in the drawing, Fig. 40. *d*, Part of the anterior crural nerve. *e*, Adductor longus muscle divided and hooked forwards. *f*, Points to the articular branches of the obturator nerve proceeding to the hip-joint and to other branches supplying the obturator externus muscle. *g*, Adductor brevis muscle. *h*, Adductor magnus muscle. *i*, Gracilis muscle. *j*, Great sciatic nerve. *k*, Capsular ligament of the hip-joint.

into the popliteal region, and there enters the knee-joint at its posterior part. The distribution of this nerve is another illustration of the same nerve supplying muscles and also the joints moved by them.

Looking at the long course and wide distribution of this obturator nerve alone, it is obvious that there are many different causes for pain felt along its branches to the inner side and interior of the knee-joint; and here I would remind you of the importance and value of precise observation with regard to the locality of pain on the surface of the skin. Tracing the trunk of the obturator nerve, we find it associated with many internal and external parts. Assuming the obturator nerve to be the seat of pain on the inner side of the knee and within the knee-joint, it is plain that this may depend upon disease within the vertebral canal, or it may depend upon some diseased condition of a vertebra near which the nerve lies. You see it passes over the sacro-iliac articulation, and when that joint is inflamed and swollen, as sometimes happens, patients complain of pain within the knee and on the inner side. I have known patients complain of pain on the inner side of the knee when the disease was not in the hip-joint. I recollect a patient—a lady whom Mr. Solly knows very well—who had a diseased condition of the articulation between the sacrum and the ilium, and suffered pain in the knee and other indications of hip-joint disease. As the obturator nerve proceeds downwards, it is obvious that a psoas abscess might produce the pain in the knee. It also runs on the left side under the sigmoid flexure of the colon, and the colon, when distended by fæces or diseased by cancer or scirrhus, is quite capable of producing pain on the inner side of the knee. Only recently I saw a gentleman from South Wales, who was the subject of stricture of the rectum from malignant disease. He suffered pain in the knee-joint and in the back part of the leg. This led me to suspect, what really turned out upon careful examination to be the case, that a large mass of cancer was involving the nerves on the anterior part of the sacrum, and also, no doubt, the obturator nerve. This was the explanation of the pain which he had experienced on the inner side of the knee-joint, partly depending upon the obturator, and partly also upon the distribution of the great sciatic nerve.

About two years since a surgeon brought a gentlemen to me under these circumstances. He said, "He is rather an irritable man, and has pains and distressed feelings all over his left leg. I want you to make out the cause." I examined the leg carefully, and it seemed to me that the mischief, whatever it was, had been impressed upon the obturator and sciatic nerves. I made some suggestions as to the cause of the symptoms, and he said, "Well now, let us go into the other room, and I will tell you what happened." I then learned that this gentleman some time ago was going officially down to Southampton by the express. Before he started he was anxious to have his bowels opened, as they were rather relaxed, but he had not time. He got into the carriage, and travelled with great rapidity, but in great pain all the way to Southampton. I suppose he did not know the strength of his little sphincter ani, but he had to rely upon it in his emergency. As I have said, he sat quietly, but in great distress, until he got to Southampton, suffering great pain in his leg. That was the history and essence of his case. It was pressure upon the sciatic and obturator nerves, which seemed to have been extreme in this nervous man, and led, I believe, to the painful symptoms respecting which I was consulted.

We know that hip-joint disease is capable of producing pain on the

inner side of the knee. This disease, on the whole, I suppose, commences more frequently in the ligamentum teres than in any other portion perhaps of the articulation.* Seeing that one branch of the obturator nerve goes to the hip-joint, a second to the interior of the knee, and a third to the inner side of that joint, I think we see how it occurs that disease in the interior of the hip-joint can produce sympathetic pain on the inner side of the knee, and in the interior of the knee-joint. I do not know

*Mr. Key, who originally (Med. Chir. Trs., vol. xviii., p. 230) brought forward this view of the usual origin of hip-joint disease, did so on the following grounds: "The beginning of the affection is often to be traced to a fall, by which the legs have been forcibly separated, and the ligamentum teres stretched. . . . The motions of the joint that give the patient most pain are strongly indicative of the seat of the affection. In the earliest stage, before the soft parts could well be affected, if the disease commenced in the cartilage, eversion of the thigh and abduction of the limb produce the greatest degree of suffering to the patient, while he can bear the joint to be flexed and to be slightly inverted without complaining." The above arguments, depending as they do on the old belief that the ligamentum teres was rendered tense by abduction, have lost much of their value now that more is known about this ligament. More importance is, I think, to be attached to two other arguments of Mr. Key, the first of which must be admitted to strongly support his theory of the origin of hip disease, when we remember that, in every examination that has been recorded of early hip disease, inflammation of the ligamentum teres was always present as the chief, if not the only, morbid appearance. "A similar indication of the ligamentum teres being inflamed is the pain sometimes expressed on pressing the head of the femur against the acetabulum. In its healthy state, the ligament, being lodged in the hollow of the acetabulum, receives but little pressure, but when it is swelled by inflammation the cavity of the joint affords it less protection, and when pressure is made by forcing the head of the femur upwards the ligament is compressed, and usually produces some degree of pain. The circumstance, too, of the ligamentum teres being destroyed by ulceration, when the head of the bone and acetabulum are only partially ulcerated, may be considered as presumptive proof of its being very early engaged in the disease."

It is well-nigh impossible to decide whether this view of Mr. Key's is correct or not. If, in examining a case of early hip disease, the surgeon endeavors to make out the condition of the ligamentum teres (rendering it tense by flexing and adducting the limb, or by rotating it outwards), he finds it impossible—his patient being usually a child from five to twelve—to satisfy himself that such movements alone either produce pain or increase it. Again, it is the rarest thing possible for patients to die from the effects alone of this disease in its early stage, and when death has taken place from some other cause, either no examination is made, or the actual cause of death is looked for, and the hip-joint left unnoticed. The fact, however, is of very great interest, that where opportunities have been afforded of examining hip disease in its early stage, the ligamentum teres has in every case been found chiefly or solely implicated. Thus, in Mr. Key's case (in which the disease had, however, lasted six months, and had been treated with partial success), the ligamentum teres was found thickened and inflamed, and the drawing and preparation show little other change save a spot of ulcerated cartilage at the root of the ligament. In a case recorded by Mr. South in his Chelius's Surgery, and in which the joint was dissected by Mr. Adams, the appearance of the round ligament was precisely similar. In a third case (the most valuable of all, on account of the specimen which is preserved in the museum of the Hospital for Sick Children), recorded by Mr. Holmes in his Surgical Diseases of Children, death having taken place a month after the first symptoms were noticed, almost the sole morbid appearance was ulceration of the ligamentum teres. So, too, in a case recorded by MM. Martin and Collineau, and mentioned (*loc. supr. cit.*) by Mr. Holmes, where death took place a few days after the first onset of the symptoms, the condition seems to have been identical. Other conditions of the head of the femur, which may be noticed after excision, point to the same origin of the disease, in that they appear to show that the first stress of the inflammation fell upon the ligamentum teres: thus ulceration of the cartilage is often most marked just at the position of the ligamentum teres, and in a case in which I recently excised the head of the femur (and I have seen a second very similar case), a distinct sequestrum lay not quite detached just below the centre of the head of the femur, immediately beneath the thickened remains of the ligamentum teres.—[Ed.]

that it is important to insist upon this piece of anatomy, because there are other explanations of the point. If we find that an inflamed tooth in the second division of the fifth nerve can produce irritation of the tongue, and cause it to be furred, surely it is not forcing the principles of anatomy and physiology to say that the obturator nerve, being involved in mischief in the hip-joint, may, by continuity, convey irritation to the surface of the skin on the inner side of the knee, and also to the interior of the knee-joint. But whether that be physiologically the true explanation or not, we knows it frequently happens that patients have pain on the inner side of the knee, and even within the knee, when suffering from hip-joint disease. I think that if the distribution of the nerves were studied in this way, trying to fix upon them some practical reference in relation to symptoms which are oftentimes very remotely situated from the real cause of the mischief, it might tend to make the study of this part of human anatomy more intensely interesting, and certainly more useful, than it at present appears to be in the consideration of many surgeons.

Reverting, for a moment, to the distribution of nerves as a means towards diagnosis, let me remind you of the insertion of these three muscles—the sartorius, the gracilis, and the semi-tendinosus. The sartorius receives its nerves from the anterior crural. The gracilis is supplied by the obturator nerve, and by it alone; it is inserted into the tibia, and attached, in part, to the fascia of the leg (Fig. 37). Then the semi-tendinosus is supplied by the great sciatic nerve, and this also is attached to the fascia of the leg. We have here three muscles—the sartorius, the gracilis, and the semi-tendinosus—all inserted into the fascia. Now, if that be true, and it undoubtedly is so, we ought to discover a particular distribution of cutaneous nerves at this point; we ought to find part of the anterior crural nerve coming to the inner side of the leg, and branches of the obturator and the great sciatic proceeding to the same point. And here they are depicted from nature (Fig. 40). Here (*b*) is the long saphenous nerve—part of the anterior crural; here also (*d*) is a filament of the obturator—that nerve which supplies the gracilis; and here again (*e*) is a branch of the sciatic nerve, a cutaneous filament—that

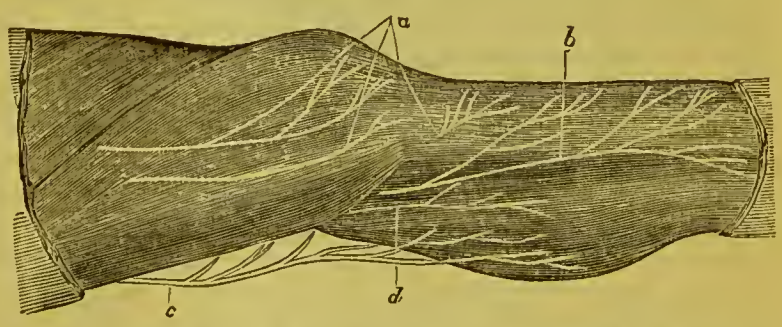


FIG. 40.—This drawing represents the various sensitive nerves supplying the skin on the inner side of the knee, the upper portion of the leg. *a*, Cutaneous branches of the anterior crural nerve. *b*, Long saphenous nerve. *c*, Cutaneous branch of the great sciatic nerve. *d*, Cutaneous branch of the obturator nerve.*

* From such experience as I have had during the two years in which I have been one of the assistant demonstrators of anatomy at Guy's Hospital, I do not think that this branch is constantly present, as theoretically it should be on Mr. Hilton's explanation. An "occasional cutaneous branch" of the obturator which occupies this position is thus described in Quain's Anat., ed. 7th, p. 662:—"In some instances the communicating" (with long saphenous and internal cutaneous nerves) "branch is larger than usual, and descends along the posterior border of the sartorius to the inner side of the knee, where it perforates the fascia . . . and extends down the inner side of the limb, supplying the skin as low as the middle of the leg."—[ED.]

very nerve which supplies the semi-tendinosus muscle itself. These three nerves, then, supply the fascia and the skin on the inner side of the lower part, and just below the knee-joint, and are directly associated with the three muscles, the sartorius, the gracilis, and the semi-tendinosus, which receive their nervous supply from them.

It is not unworthy of admiration to see the precise position of these muscles. If you measure with accuracy the distance of the points of insertion of these muscles between the fulcrum (or the hip-joint) and resistance (or the foot), you will find that these muscles are inserted just beyond the mid-distance between the fulcrum and resistance. If you take the measurement from the hip-joint, for example, down to the point of insertion, and measure the whole length from the hip to the sole of the foot, you will find that the point of insertion is just beyond the half-way between the fulcrum and the resistance. Hence the gracilis is a great help to the adductors of the thigh; it helps to adduct the leg; it goes far enough to seize the limb just beyond the midway between the fulcrum and the resistance. Again, the semi-tendinosus, a powerful flexor, and the sartorius in like manner, are inserted just in the same way. The sartorius, then, is a very powerful assistant to the muscles employed in the first effort of progression, slightly everting the leg, spreading out the foot, and widening the base of the column, so as to make it more easy for man to maintain the upright posture.

In a former lecture I made use of two or three diagrams (Figs. 11 and 12), to point out the importance and value of knowing precisely the distribution of the nerves to the skin of the head and face. If a patient complain of pain at a certain part, supplied only by one sensitive nerve, it is certain that nerve must be the seat of the pain.

Now let us apply the same method in examining the cause of pain on the inner side of the knee. Here are nerves from three different sources —the obturator, the anterior crural, and the great sciatic. It is quite clear, then, that if the patient complain of pain on the inner side of the knee-joint, we ought not to be satisfied without ascertaining which of the nerves produces that pain. We know that there are three possible lines of direction for this pain, and we are bound to examine those three lines of direction for the purpose of ascertaining in the course of which nerve the real cause is situated. For this purpose we ought carefully to examine the anatomical relations of the obturator, the great sciatic, and the anterior crural nerves, in order to ascertain, if possible, the real cause of pain expressed on the inner side of the knee-joint; for it is obvious that a disturbing cause associated with the course of any of these might produce the pain.

I must not, however, continue the subject further, but Fig. 40 shows, I think, very accurately these points. The three muscles—the gracilis, the sartorius, and the semi-tendinosus—instead of being spoken of, as they usually are, as flexors of the knee-joint, ought rather more physiologically to be regarded in reference to their association. Their nervous supply suggests that association to be in this way: the sartorius with the anterior crural, the gracilis with the obturator, and the semi-tendinosus with the great sciatic nerve.

Let us fix another practical and useful reference to this distribution of nerves. From it I would offer this suggestive explanation of what is termed hysterical hip- or knee-joint disease :—

Explanation of Hysterical Pains in the Hip- or Knee-Joint.

The sacral ganglia and the lower lumbar ganglia of the sympathetic nerve are connected with the great sciatic nerve, and partly also with the obturator nerve. These same ganglia are connected likewise with the nerves proceeding through the broad ligament to the uterus and to the ovaries. I think we have here, then, an explanation of the frequent occurrence of what we call hysterical hip-joint or hysterical knee-joint. If the nerves in the ovaries or the uterus be in a state of irritation, that irritation can be conducted to these sacral nerves or to the obturator, and then, in accordance with the generally received law of distribution of nervous influence, irritation or pain may be manifested at the other peripheral or articular end of the same nerve. Hence it may be expressed within the knee-joint, on the inner side of the knee-joint, or it may be within the hip-joint because the hip-joint as well as that of the knee receives its nerves from these various sources. The posterior part of the hip-joint, you will remember, has nerves coming to it from the sacral plexus. The sacral plexus receives some filaments from the sacral ganglia; so do the uterine and ovarian nerves; and it is quite possible, nay, I think is very likely, that the irritation commencing in the ovaries or the uterus might be conveyed to some of the filaments derived from the same ganglia in the sacrum, and irritation in the hip-joint be thus produced. You will observe that the two nerves, which are so distributed as to be capable of producing the pain in the joints, are the great sciatic and the obturator; and I believe this is a probable explanation of the fact, that of all the joints in the human body affected hysterically as we term it, none are so frequently involved as those of the hip and the knee.* By tracing these two nerves,

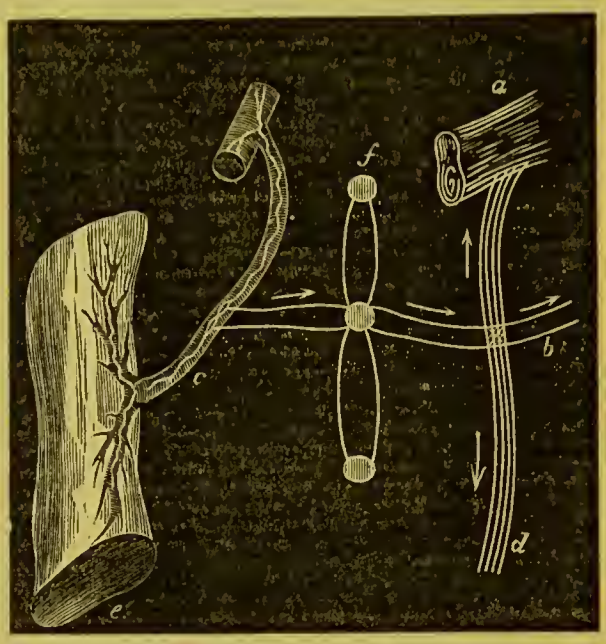


FIG. 41.—*a*, Spinal marrow. *b*, Spinal nerves going to the posterior part of the body behind the vertebral column. *c*, A visceral artery accompanied by branches of the sympathetic nerve. *d*, Common spinal nerve, composed of motor and sensory filaments. *e*, Portion of intestine (uterus or ovary) receiving minute filaments from the spinal nerves and sympathetic nerve. *f*, Ganglia of sympathetic nerve, united to each other by longitudinal filaments, and receiving branches from, as well as giving off branches to, a common spinal, motor, and sensory nerve.

The arrows indicate the directions which any intestinal, uterine, or ovarian irritation might pursue centrifugally either directly backwards to the skin in that region, or might proceed with a spinal nerve to its muscular, articular, or cutaneous destination.

* Sir J. Paget, to whose lot it has fallen to see more of these cases than to any other surgeon, save, perhaps, the late Sir B. Brodie, speaks as follows in his Clin. Lect. and Essays, edited by Howard Marsh, p. 197 :—"Among all the joints, the hip and the knee, which are the most frequent seats of real disease, are equally so of the mimicry —a fact not easy to account for. It may be due to mental association, perhaps unconsciously, or to a mingled inheritance—for instance, to an inheritance of nervous constitution and of relative weakness in the joint or joints most weak in progenitors." —[ED.]

I think we may find a probable interpretation of that frequency. I have here constructed a diagram intended to represent what I have been alluding to. Suppose this (*f*) to represent the three ganglia of the sympathetic; we have then a spinal nerve (*d*) attached to the spinal marrow, and taking its onward course to the muscles and the skin. We know that these spinal nerves communicate with the ganglia, and so, by the sympathetic branches travelling along the arteries (*c*), reach the intestine (*e*), uterus, and ovaries. Let us assume, then, that a patient may have irritation from any cause in the intestine, in the uterus or ovaries, or in the broad ligaments. On this map we may trace the course of that intestinal, uterine, or ovarian irritation through the ganglia, through the spinal nerve and spinal marrow, thence to be reflected to any part of the peripheral or articular distribution of that same spinal nerve. This condition, I apprehend, is sometimes very clearly recognized in the case of the intestines. Who is there that has not felt griping pains in the interior of the intestines from some morbid agent lying there, or from drastic purgatives traversing the gut, accompanied by pains or cramps in the leg, and pains in the loins?—conveyed in the latter instance by the filaments of spinal nerves, which pass to the posterior part of the body or the lumbar region. And is it not a common occurrence in cases of uterine and ovarian irritations for the patients to complain of pain in the loins, but particularly over the posterior part of the sacrum? The ovarian and uterine nerves traverse the ganglia of the sympathetic, and so reach the spinal nerves. Hence the morbid influence conveyed by the posterior branches of the spinal nerves to the skin over the lumbar and sacral regions explains the lumbar and sacral pains experienced by such patients.

LECTURE X.

Muscular and Cutaneous Distribution of the Nerves of the Knee—Dislocation and Contraction in Diseases of Knee-joint—Treatment—Muscular and Cutaneous Distribution of the Gluteal Nerves—Order of Supply in the Distribution of Nerves to Different Muscles—Pain on One Side of Penis Depending on Disease of the Perineal Branch of the Inferior Gluteal Nerve—Enlarged Bursa on Tuberosity of Ischium—Relation of the Peritoneum to Cutaneous and Muscular Distribution of Nerves—Application to Practice—Relation, by Nervous Distribution. of the Pericardium to the Diaphragm.

In the latter part of the last lecture I directed your attention to the numerous nerves which are placed around and within the interior of the knee-joint. I observed that those nerves are derived from many sources, and I may now add that the great sciatic not only sends branches through the popliteal region to the posterior part of this joint, but its external popliteal branch supplies many numerous deep filaments to the outer side of the knee-joint, both above and below the inter-articular space. The distribution of these latter nerves is well shown in this sketch (Fig. 42) taken from Mr. Swan's book.

I dwelt especially on the distribution of the great sciatic, the anterior crural, and the obturator nerves to the three so-called flexor muscles inserted on the inner side of the knee, and their fascial insertion, and to the overlying skin. I took occasion to remark that these nerves ought to be made the medium of an attempt to elucidate any sensations of pain which might be experienced on the inner side of, or within, the knee-joint. These observations are, of course, directed to those cases where the pain is extreme or severe within the knee-joint or on its inner side, when there is not the slightest evidence given by heat of local inflammation, the absence of which clearly indicates that such pain depends upon a cause situated remotely from the point of manifestation. I endeavored to show, that by tracing these nerves upwards or centrally, we may have an opportunity of detecting the real cause of the pain. I think we should make use of these nerves for another purpose. It is quite certain that local anæsthetics, applied to the cutaneous branches of nerves which supply the muscles, have a power of action upon those muscles which reduces their spasm, lessens their contractions, and thus removes one source of irritation from an inflamed joint. I shall not have occasion in this lecture to speak on this subject again; but, as some think that in the use of fomentations it is a matter of little importance whether they be medicated or not, I beseech those who do so to carefully reconsider the opinions which they may have formed on this subject, because I am quite certain (and I speak from a fair amount of experience, and close observation, too, on the matter) that local anæsthetics applied to the skin over the knee-joint have a power of diminishing pain—in the hip-joint for example. They certainly have a capability of diminishing excessive sensitiveness, even in the interior of the knee-joint. I verily believe (though this is referring apparently to a small matter) that the reason why these applica-

tions are so often ineffective, and why they are not more frequently employed, is, that the solutions are not strong enough, and that the proportion of the anæsthetic materials is not sufficient. This being granted, I have no hesitation in saying that we have the power of acting upon the sensitive nerves, and diminishing pain in the interior of a joint, by the local application of anæsthetics to the peripheral extremities of the nerves.

Another disturbing cause in an inflamed joint, as I have already intimated, is muscular force, the muscles unceasingly contracting day and night. In every case of diseased joint, if you will compete with this muscular contraction by the means of some mechanical resistance, such as a firm, resisting splint, you will counteract its effect.

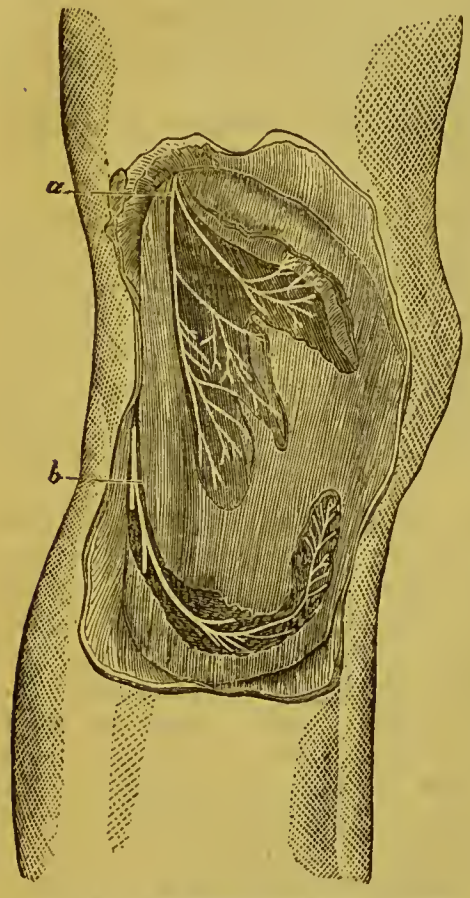


FIG. 42.—*a*, Branches of the external popliteal nerve proceeding to the capsular ligament of the knee-joint. *b*, Recurrent branch quitting the trunk of the peroneal nerve just as it passes over the neck of the fibula, and thence proceeding to the inferior and outer part of the knee.

I will confine my observations in this lecture to the knee-joint, and I only enter upon the subject for the sake of giving a little practical interest to what might otherwise appear to be a matter of dry anatomical detail. Having dwelt upon the anatomy, which is in itself very important, I feel that one ought not to lose sight of its practical application; for if we cannot make anatomy and physiology useful in practice, the information is scarcely worth its acquisition.

Fig. 43 represents a diseased knee-joint, where the muscles have had their fullest opportunity of doing, so to speak, exactly what they like with the joint. It follows the common rule of dislocation of the *tibia* and fibula outwards and backwards, and points at once to the cause of the dislocation taking that direction. I think it will be in accordance with experience that in almost every case (I do not like to say every case, because some exceptional instance may have presented itself to those present) the tibia and *fibula* are dislocated backwards and outwards under the influence of the biceps, and rotated inwards by the popliteus.* Now, the biceps was shown in my last lecture to be supplied from nerves which supply also the interior of the joint. For the purpose of showing the application of this point, I say we ought to resist muscular force through the means of splints or other mechanical resistance, or we may divide the tendons of the muscles which produce this displacement. I have a case which will serve to illustrate this point. It is only one of many that I

* This displacement being permitted to take place by the softening and ulceration of the ligaments, more particularly the crucial, the anterior of which checks rotation inwards, and so counteracts the popliteus, while the posterior prevents rotation outwards, the action of the biceps.—[ED.]

might adduce, and hereafter I may be able to develop this subject more completely.

This sketch (Fig. 44) was taken from nature on the 3rd of June, 1861. The history of the case is very short. The patient is now sixteen. He was admitted under my care at Guy's Hospital in October, 1856. He had already been in a London hospital between three and four months, and had left it six months before I saw him. The surgeon under whose care he was, judging from the boy's appearance, from the suppuration taking place in the joint, the general tendency to displacement, and the constitutional disturbance from which he was suffering, the indications of perhaps a rapid death, proposed to the patient that the leg should be removed or the joint excised. The boy was only eleven years old, so that he had not much voice in the matter; but his father and mother, when consulted, would not accede to the recommendation: the patient was therefore removed from the hospital. In October, 1856, he came under my care. At that time the joint was in a bad condition, there was a good deal of swelling, suppuration had occurred, and abscesses were discharging pus freely. The leg was rather more than semiflexed; the pain in the joint was not very severe, except when it was moved or handled; and the amount of discharge was somewhat diminished. The whole of the joint and surrounding structures were much swollen from infiltration with serum and lymph. Seeing the boy in this condition, and having observed several other like cases (one as early as 1844, where active disease was going on, and where, after I had divided the tendons of the flexors, the patient did very well), I felt that I might trust to previous experience. Instead, therefore, of proposing amputation or excision, I resolved to divide the tendons of the flexors, which were disturbing the joint.

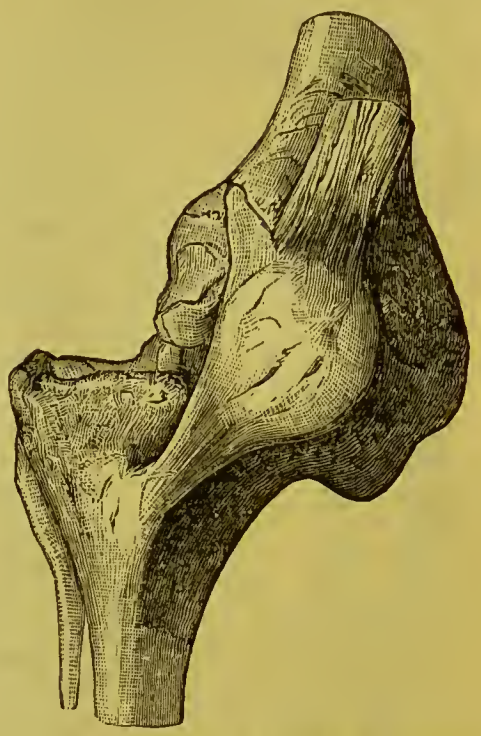


FIG. 43.—From a preparation in the Museum of Guy's Hospital.

Three weeks after admission, and after giving the patient chloroform, an attempt was made to put the leg straight, but without success, the muscles being too contracted; so that it became necessary to divide the tendons of the flexors. I divided the tendons of the biceps muscle, the gracilis, semi-tendinosus, and the semi-membranosus. The latter were all divided in the popliteal region, close to the inner side of the head of the tibia, and the biceps tendon was severed about one inch above its insertion, taking care, of course, to avoid the peroneal nerve. The limb was then put upon a straight wooden splint, and remained so during eight months. By the aid of simple strapping and pressure, the joint soon became free from pain. At this time the leg was nearly straight, and the patient was almost free from any constitutional disturbance, the discharge being exceedingly small. It was then thought right that he should go to the Margate Infirmary, whither he was sent by the benevolence of the late Mr. Couchman in the summer of 1858. He remained at Margate one

year and ten months, supporting himself on crutches, and afterwards using a stick for several months. Whilst at Margate the wooden splint was removed, and a gutta percha one put on the limb, with a bandage. Soon after that the knee began to be a little flexed, and the tibia to be displaced slightly backwards and a little outwards, so as to deform the joint in rather a worse manner than the sketch indicates. I think it was an error to take off a resisting splint like wood or thick leather, and to put on gutta percha. The result of it was, that the leg became a little more flexed. I am certain that when the boy went out of Guy's Hospital the knee-joint was straighter than the representation you have now before you. I need not trouble you with the further details of this case. During the next year and a half the boy did not use a stick or crutch; he had no pain, he could walk three or four miles without difficulty, and was occupied the whole of the day in business. On examining him, I found the patella affixed to the femur, but there was a slight degree of motion between the tibia and femur. I think this is a good case for showing the value of giving rest to a joint, for that is all I did. I did nothing more than any other surgeon could have done. I simply divided the tendons which were the disturbing cause, and then we had no further difficulty in keeping the articular surfaces in contact. In the course of time Nature consolidated the parts, leaving the boy with his leg in the state represented, which is not exaggerated in the slightest respect, but is an exact representation, as far as the artist could accomplish it, of the leg as it was on June 3rd, 1861. I repeat that it seems to me that this is a very good illustration of the value of rest considered with reference to the disturbing causes — those disturbing causes being the muscles, which disturbed the joint in consequence of the irritation in the interior of the joint being conveyed to the muscles, through the same nerve that supplies both the joint and the muscles. Here (Fig. 45) is a ground plan of this boy's feet, showing that the right foot (the diseased side) was not quite so much developed as the left.

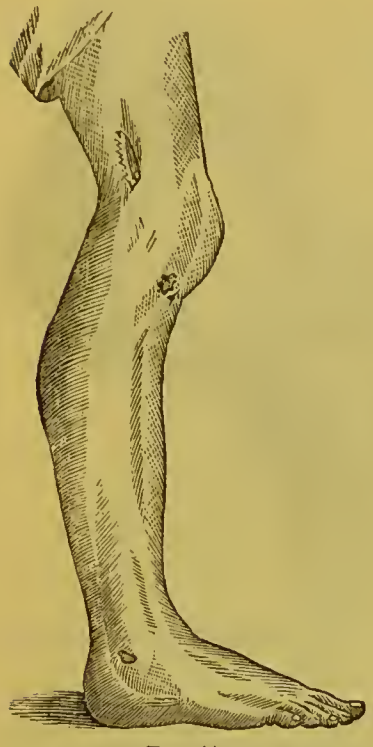


Fig. 44.

I have made these observations for the purpose of forcibly reminding you of the value of rest, and its practical application.

Having to trace a few more nerves in their muscular and cutaneous distribution, I will take the superior gluteal nerve. Every anatomist will remember that this nerve is derived from the lumbo-sacral cord, and that, after passing out of the pelvis at the great sacro-sciatic foramen, it is distributed to the gluteus medius, the gluteus minimus, and the tensor vaginæ femoris. In this drawing (Fig. 46) we see the associated cutaneous lumbar nerves coursing along the lower part of the abdomen, then over the crest of the ilium, and distributing themselves to the skin over the gluteus medius and the gluteus minimus. You may observe how they seem to avoid the skin over the gluteus maximus, which, together with that muscle, is supplied by the small sciatic. Thus we have another example of the same nerves supplying muscles and the skin over those

muscles, although the cutaneous and muscular portions do not, as is usual, travel together.

Speaking of nervous supply, I might direct your attention to two nerves which take a very peculiar course, and may, to some minds, denote the special interest which belongs to this inquiry. I refer to the course of the spinal accessory and recurrent larnygeal nerves. We see the spinal accessory arising from the cervical portion of the cord, passing upwards, and blending with the sub-occipital nerve. The sub-occipital is almost exclusively a motor-nerve; it is usually devoid of any sensitive filaments, and is distributed to the superior and inferior oblique, the two recti, and the complexus muscles on the posterior aspect of the neck and cranium. Now, I think that the sub-occipital nerve, before it sends filaments to supply this group of muscles, receives a branch from the spinal accessory. When these muscles are in a state of contraction, they carry the head backwards, and fix it for a purpose which we shall see presently. The spinal accessory nerve passes to the interior of the skull through the foramen magnum, and out of it through the jugular foramen, where it has intimate structural association with the pneumogastric nerve especially (I do not detain you with the minutiæ of this, but simply state the broad fact); and having established that communication, it takes its downward and backward course through the neck to reach the sterno-mastoid and the trapezius. Here, then, is a nerve taking the very peculiar course which I have pointed out. Now, it does not signify how fast the nervous influence passes, it must reach the nearest point first. Assuming, then, a message to be conveyed through the spinal accessory to the muscles, it would first reach, by the branch to the sub-occipital, those which have the power to fix the posterior part of the skull; the message is then sent on to the sterno-mastoid and the trapezius. The posterior part of the head being already fixed, these two large and powerful muscles act more effectually in concert with the pneumogastric nerve in the process of respiration. From this explanation I think we see one of the reasons why the spinal accessory nerve should take such a tortuous course.

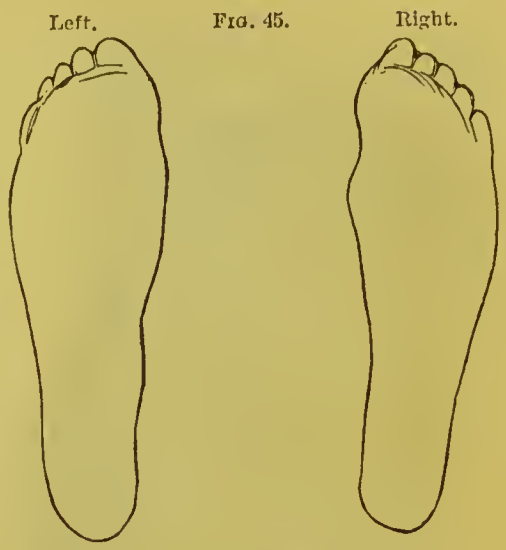


FIG. 45.

Let us now take the nerves to the larynx. And here I might at once point out what I shall not now, unfortunately, have the opportunity of laying before you in its extended form—that the same nerves which supply the mucous membrane supply also the muscular apparatus acting upon that membrane. This is a uniform law with respect to all the mucous membranes of the body, and is well exemplified in the case of the larynx. You know that the superior laryngeal nerve of the pneumogastric distributes itself upon the mucous membrane of the interior of the larynx, including the laryngeal surface of the epiglottis. This same pneumogastric nerve sends off a recurrent branch, distributing itself to all the intrinsic muscles of the larynx, except the crico-thyrodeus. Thus the pneumogastric nerve supplies the muscles which move the vocal cords, and the membrane lining the interior of the larynx. Here, then, we have an

illustration of the same nerve supplying the muscular apparatus which acts upon the vocal cords, with their investing mucous membrane, as well as the rest of the laryngeal mucous membrane and the joints of the larynx, just as we have seen the same nerve supplying the muscle, moving the joint, the interior of the joint, and the skin over the insertion of the muscles. The superior laryngeal (or sensitive nerve) is accompanied by a motor branch, which proceeds directly to the crico-thyrodeus muscle; and while considering this crico-thyroid branch, I must remind you of what I just now stated—that no matter how rapidly the nervous influence passes, it must reach the nearest point first, and that is apparently the reason why this little nerve takes so short a course to the crico-thyroideus. It has long been my habit to regard the crico-thyrodei as the muscles which are intended to tune the vocal instrument; and, as the instrument must be tuned before it can be played upon, so this nervous influence first reaching the crico-thyrodei, the vocal cords are put into a due state of tension, preparatory to the more precise and accurate influence of the other muscles acting directly and indirectly upon the vocal cords. But let us try to explain why the recurrent laryngeal takes so peculiar a course. Some say it must be because it has to wind over the subclavian artery on the right side, and around the arch of the aorta on the left side. Now, it has fallen to my lot to see examples in the dissecting-room in which the nerve did not wind round the arch of the aorta or the subclavian artery, yet the course of the nerve was, notwithstanding, equally recurrent, thus clearly indicating that it had no necessary relation with the subclavian artery or the aorta. The nervous influence, whatever it may be, which travels by these recurrent nerves, goes from below upwards. And I think it will be apparent why this nerve takes its course from below upwards. It is an essential thing, to my mind, that the muscles which are acting upon the air as it escapes outwards from the lungs so as to make the voice, should be acting from within outwards—that is, from the lower part of the larynx to the upper. It is quite obvious that if they acted in the other way, we should all be ventriloquists, talking inwardly to ourselves, as it were, and having no external voice; and it is for the purpose of determining the direction of influence from within outwards that we find this nerve pursuing this singularly recurrent course, ultimately distributing itself to these different muscles. The spinal accessory and the laryngeal nerves are, I think, two good examples of the rule—that there are strong reasons for the remarkable order observed in the supply of nerves to muscles (see pages 102—104).

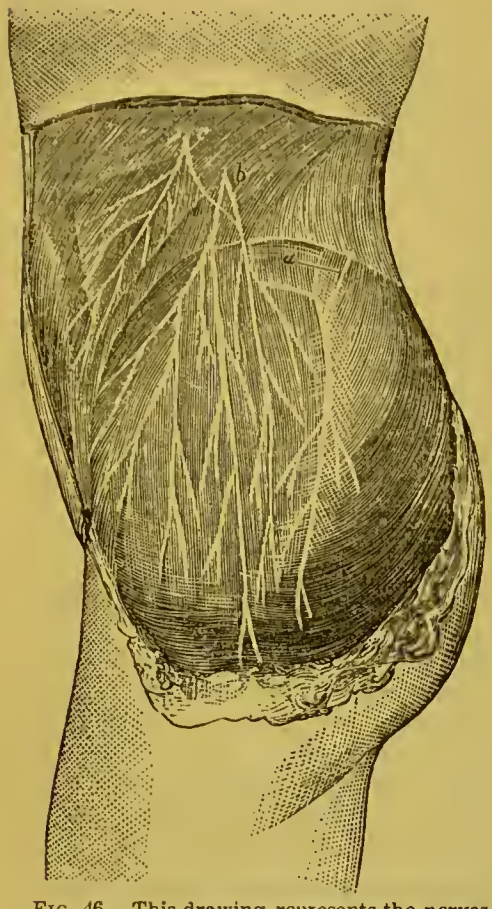


FIG. 46.—This drawing represents the nerves supplying the skin over the gluteous medius, gluteous minimus, and part of the tensor vaginæ femoris. *a* and *b*, Ilio-lumbar and lumbar gluteal nerves, derived from the lumbar plexus.

I will now adduce another illustration of the same nerve-supplying muscles and the skin associated with the muscles. Here is a diagram taken from nature, intended to show the distribution of the small sciatic nerve, or, as some term it, the inferior gluteal. This nerve most frequently presents itself to the dissector as a single trunk. Here, however, you will observe that the muscular branches seem to come off from the great sciatic. Now, although this is not quite in accordance with what I might have wished, I thought it better that all the diagrams exhibited here should be made strictly from dissections, a rule observed in every one of the drawings I have placed before you. In this instance it so happens that the motor filaments of the inferior gluteal nerve come off apparently from the great sciatic. I have very little doubt, however, that if these motor filaments had been traced upwards towards the spine, we should have there found intimate associations between the cutaneous filaments and the motor portion of the same inferior gluteal nerve. I do not speak lightly of this explanation, because I have several times—not with this nerve, but with other nerves—found that to be the case. Where the motor nerve comes off unusually, if you trace it upwards some distance towards the spinal marrow, you will find that it is in communication with its proper cutaneous nerve. Let us suppose that these muscular and cutaneous branches of the inferior gluteal nerve are in their normal association, and we shall see that this inferior gluteal nerve supplies the gluteus maximus muscle, and sends out cutaneous branches, which distribute themselves over the lower edge of that muscle. It then sends a branch across the ischium, towards the perineum, and here it is seen (Fig. 48) coming close to the tuberosity of the ischium, near to the seat of a bursa placed there; afterwards it joins a branch of the pudic nerve, and they proceed together to the genitals. You will observe that the gluteus maximus is firmly inserted into the fascia of the thigh; it is one of the most important muscles in reference to this fascia, which may, indeed, be considered as part of the insertion of the gluteus maximus. We ought, therefore, to find nerves proceeding from the same trunk which supplies the gluteus maximus to the skin over this great length of fascia; and so we do. The fascia is here cut through, and the cutaneous nerves are left distributing themselves with beautiful precision to the skin over the posterior part of the thigh, and going down below the popliteal region. Thus the distribution of this nerve, which at first appeared to stand in opposition to the principle of distribution which I have mentioned—viz. of the same nerve supplying the muscle and also the skin over the muscle—is in reality a strong exponent of that view, when we admit that this fascia is firmly connected with the gluteus maximus, and ought to be considered as part of the insertion of that muscle.

With regard to the branch of the small sciatic which passes inwards to the perineum and genitals, I think we way see reasons, associated with coitus and the action of the gluteus maximus muscle, why a cutaneous branch should go to this region. This is a subject, however, which I do not wish to dwell upon, but merely direct your attention to the fact.

The recognition of the distribution of the pudic or perineal branch of the inferior gluteal nerve is sometimes important in practice.

Case of Pain on one side of the Penis depending on Disease of the Perineal Branch of the Inferior Gluteal or Small Sciatic Nerve.

Soon after the death of the late Mr. Key, a gentleman came to me saying, "I have something the matter with my urethra and bladder, and

I suffer pain in the penis." He had been under the care of Mr. Key and another surgeon, who had treated him for diseased bladder and various other things. I begged him to show me precisely where the pain was

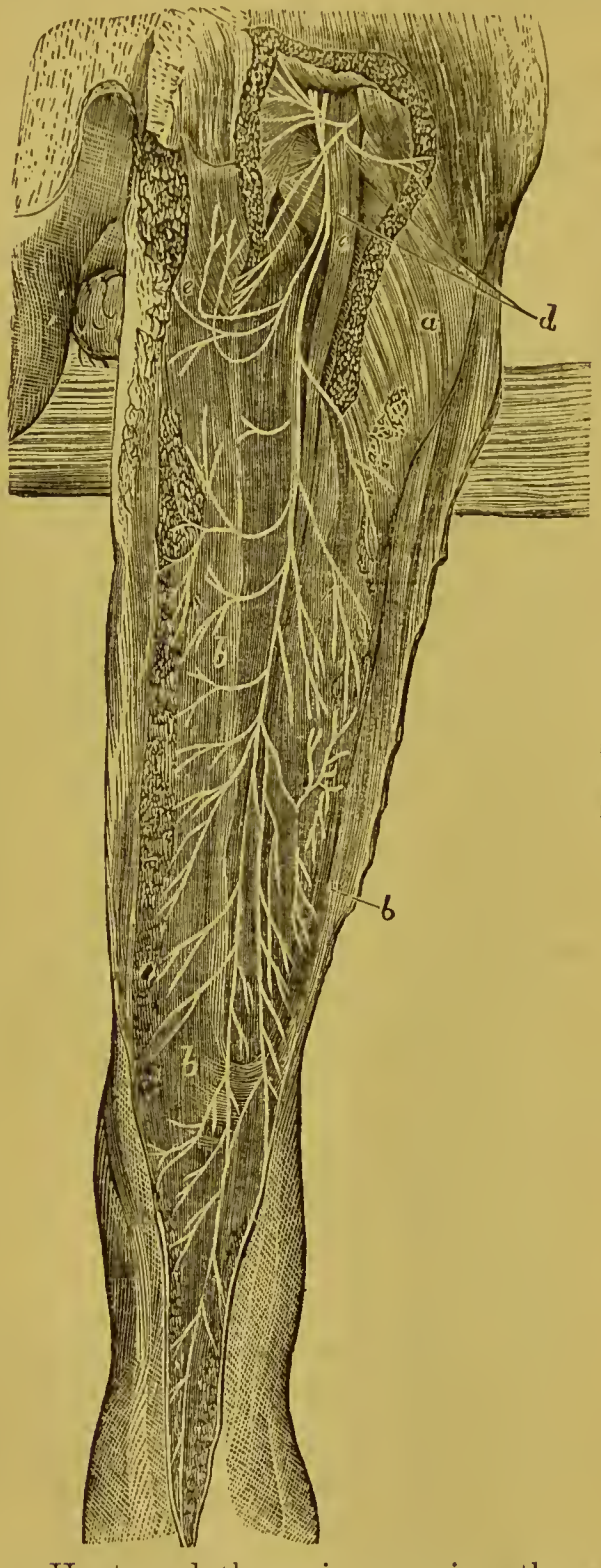


FIG. 47.

This drawing represents the muscular and cutaneous distribution of the small sciatic or inferior gluteal nerve.
a, Gluteus maximus divided vertically so as to expose to view the sciatic nerves.—*b b b*, The fascia of the back part or the thigh divided vertically. The continuity of this fascia above with the gluteus maximus, and below with the fascia of the leg, is well displayed.—*c*, Great sciatic nerve.—*d*, The two lines extending from *d* proceed to the muscular and cutaneous branches, which together form the inferior gluteal nerve.
The muscular branches are shown supplying the gluteus maximus muscle.
The cutaneous branches are divisible into two. One, the larger, supplies the skin covering the fascia to which the gluteus maximus is attached. The other (*e*) is the genito-perineal branch, which crosses the anterior part of the ischium in order to reach the perineum and genitals.

situated. He traced the pain, crossing the ascending ramus of the ischium, to one side of the penis. This looked more like a one-sided than a central cause. Upon careful examination of the neighborhood of the tuberosity and the ascending ramus of the ischium, I found a considerable

thickening of the soft parts, and, after some manipulation, I felt a cord-like mass rather bigger than whip-cord. On making pressure upon it, he said, "That is what gives me pain." It was quite apparent that the cause must be associated with the perineal branch of the inferior gluteal or the pudic nerve, for no other nerves go to the side of the penis. I think Mr. Key and others had well sought for the cause in the pudic nerve, but had not detected it. It was obvious that pressure upon the perineal branch of the inferior gluteal nerve gave the pain along the side of the penis. Upon inquiry it turned out that this gentleman was accustomed to sit upon a hard and somewhat uneven seat; this led to the thickening of the soft parts, and to the pressure on the nerve which produced the painful sensations he had experienced. I explained what I thought was the cause of the pain, and he said he was willing to do everything I thought necessary. I then applied some strong nitric acid over a circle about an inch and a half in diameter, covering the thickened structures, which included the nerve, so that he could not sit upon the part; and I desired him to have a hole made in his chair, or to use a hollow cushion. He adopted that course, and immediately the symptoms began to subside, and in three or four weeks they were all gone. Not a single thing was done but this. We see, then, that an acquaintance with the distribution of even this branch of nerve may be of the greatest importance in practice. This patient was cured by removing pressure from the nerve, and so giving it rest.

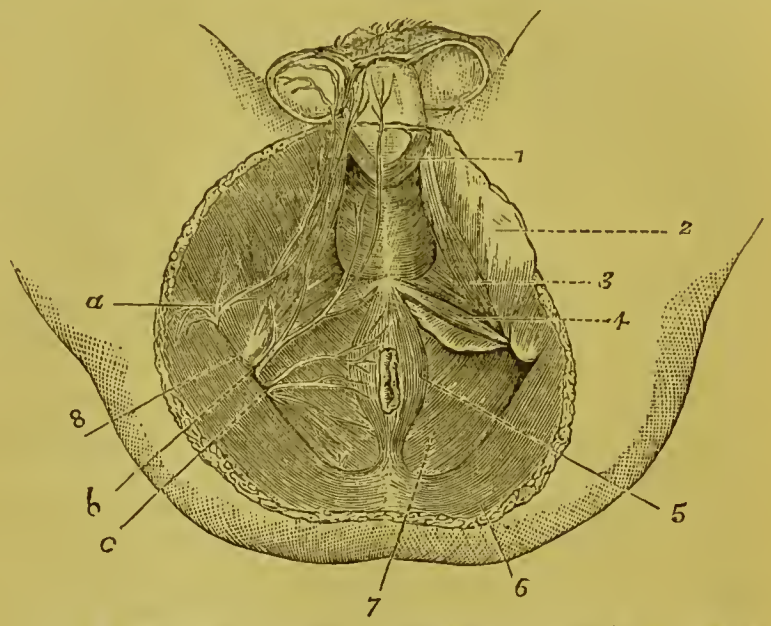


FIG. 48.—This figure is taken, by permission, from one in Mr. Heath's Practical Anatomy.

The nerves (for the sake of clearness several are omitted) are shown on one side, the muscles on the other.

1, Anterior fibres of accelerator urinæ. 2, Deep layer of superficial fascia cut through and turned outwards. 3, Erector penis. 4, Transversus perinæi; below this is seen another portion of the perineal fascia originally continuous with 2. 5, Sphincter ani. 6, Gluteus maximus. 7, Levator ani. 8, Tuberosity of ischium.—*a*, Genito perineal or inferior pudendal branch of small sciatic nerve. *b*, Perineal branches of pudic nerve. *c*, Inferior hæmorrhoidal branches of pudic nerve.

This case does not stand alone. A surgeon has sent me these notes of a case that I saw with him some years ago, which was cured by "rest."

"*Enlarged Bursa upon the Tuberosity of Ischium.*—On August 10th, 1860, my attention was directed by a lady, aged sixty, to an enlargement near, and rather on the anterior part of, the left tuber ischii, which was increasing in size, and becoming daily more inconvenient. She had been aware for a considerable time of some unusual numbness and painful sensation in the part itself, and neighborhood of the labium on the same side, more especially when riding in her carriage and sitting in her study, but had only discovered a marked enlargement a few days before.

"On examination, a deep-seated movable or pliant swelling could be

detected, which, on being compressed by the fingers, conveyed a somewhat vermicular sensation, with a sense of fluctuation in it, though cyst-like. The examination was painless. Iodine was applied daily, and the use of a hollow seat recommended. The swelling increased in size, and became more painful. Mr. Hilton was consulted on Aug. 25th. The swelling had become more tense and globular, with indistinct fluctuation, surrounded by some undefined consolidation and enlargement. Mr. Hilton pronounced it to be an enlarged bursa, and thickening of the structures surrounding it; no heat or redness; no local evidence of suppuration. The patient was directed to have a pad made, with a circular hole in it to receive the swelling, and made so that it could always be worn, and thus effectually remove all pressure from the part. He directed an eschar to be made with nitric acid over the enlarged bursa, so as to prevent the patient sitting upon the part, &c. The eschar separated on the sixth day, and the swelling gradually diminished.

"At the end of September—that is, in one month—I could only detect an ill-defined, deep-seated vermicular thickening which has since still further diminished.

"May, 1861.—The patient continues to protect the part from pressure by the pad, and has not been reminded of her affection since October, nor does she now suffer any inconvenience."

I had known this lady for some time, and was aware that she sat daily during many hours, occupied in literary pursuits. She explained to me how she sat on a hard chair, with a little table on her left hand, and she said, "As I read, I am obliged to sit sideways on my left side, in order to make my notes without getting up." I have no doubt it was that distorted position which led to pressure upon the bursa, and thence to thickening of the surrounding structures, which, involving the perineal filaments of the inferior gluteal nerve, caused these unusual sensations in the neighborhood of the vagina. Here is another case illustrating the value of recognizing the distribution of even so small a branch as the perineal, derived from the inferior gluteal nerve. The bursa was cured by "rest," and the vaginal symptoms subsided.

As a last observation with respect to the distribution of cutaneous nerves, and their influence upon the muscular apparatus—in the hope of laying the matter before you more explicitly another time—I would remark that part of the contraction resulting from the cicatrices of burns may depend upon the circumstance that when the burn takes place the nerves of the skin are exposed. The irritating influence of atmospheric air acting upon the denuded nerves or granulations may be conveyed to the associated muscles, and may thus in part contribute to the subsequent contraction. This may remind us of the importance of using mechanical extension during the cicatrization of burns.

It seems to me that if the anatomy which I have advanced for your consideration be correct, and the law of nervous distribution which I have affixed to it in reference to the joints be true as a broad principle, we ought to find a corresponding arrangement in the serous and mucous membranes of the body. The same trunks of nerves that supply the muscular apparatus should supply also the serous membranes which those muscles move. With regard to the mucous membranes, also, the same nerves that supply the muscles which move the walls should supply the mucous membrane which lines those muscular walls. Here, perhaps, it might be thought that in dealing with the peritoneum, the pleura, and the pericardium, I am treading on the domain of the physician. But surely

these parts belong as much to medicine as to surgery, and to surgery as to medicine. It appears to me to be a fictitious line which divides the principles of medicine from the principles of surgery. Both must be essentially based upon precisely the same physiological and pathological laws, and therefore if I, as a surgeon, show you that there is a certain systematic distribution of the nerves to the muscles, to the skin, and to the joints which those muscles move, surely I may be at liberty to extend my illustrations to other parts of the body—viz., to the serous as well as the mucous membranes. On this part of my subject I propose to dwell only for a short time.

Let us take, for example, the peritoneum; and I will divide the abdominal parietes into two parts—an upper and a lower, the line of demarcation being the umbilicus; the upper part of the abdomen being the respiratory portion, whilst the lower half of the walls may be considered as strictly abdominal. You may see in Fig. 50, *d*, the nerves coming down from the spine to the abdominal muscles, and supplying also the peritoneum of the abdominal parietes. In this drawing (Fig. 49), taken from a recent dissection, we see some of these same nerves displayed upon the skin of the exterior of the abdomen. Here, then, we have the same nerves which supply the lower half of the abdominal muscles extending themselves to the cutaneous aspect below the umbilicus, and distributing filaments to the skin over the muscles which are supplied by the same nerves. I might also say that I believe that the same spinal nerves send filaments to the visceral peritoneum covering the intestines. I may direct your attention again to the diagrammatic map (Fig. 41) which I used in my last lecture to point out the relation of the spinal and sympathetic nerves to each other, and to indicate the nerves of communication between the spinal marrow and the sympathetic ganglia. I venture to express my belief that some of these filaments of spinal nerves go through the sympathetic ganglia, and thence, associated with the sympathetic, travel upon the artery, and become ultimately distributed, I believe, to the walls of the small and large intestine. I remarked in that lecture that there could be but few persons who had not experienced "painful sensations" in their intestines, and that such sensations could only be derived from, or transmitted through, the spinal nerves. The colon is the intestine which ought to be physiologically associated with the lower half of the abdominal walls, because they aid the peristaltic action of the colon to empty the large intestines of their fæcal contents. Here we see, then, that the same nerves supplying the abdominal muscles supply the parietal peritoneum and the skin over those muscles; and further, through the medium of such a map

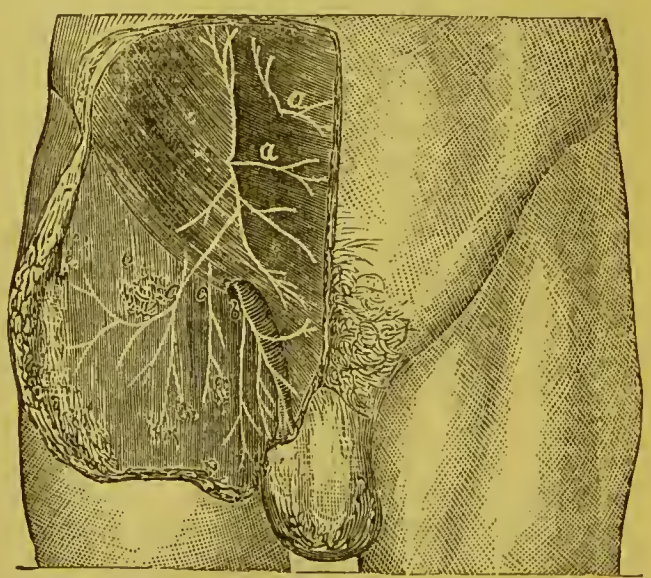


FIG. 49.—This sketch represents a part of the distribution of the abdominal nerves to the skin over the muscles. branches of the same nerves supplying the muscles themselves and the peritoneum. *a a a*, Abdominal nerves distributed to the skin. Other nerves are here displayed, but they are not in relation to my present subject.

as Fig. 41, we may have the indication of some of the spinal nerves proceeding to the serous membrane of the intestines, or to the other structures forming the walls of the intestines. The muscular apparatus of the abdomen, its serous membrane, the skin over the muscles, and the intestines themselves, are thus brought into harmonious association.

I think I am not putting this proposition too strongly when I say that we never see a case of acute peritonitis where the abdominal parietes are not drawn backwards upon the contents of the abdomen. Perhaps the only exceptions are cases of the asthenic forms of peritonitis which depend upon the blood being poisoned; then the influence of the nervous system is as nothing, and we should not expect to find this tense and tight condition of the abdominal parietes. But excluding this kind of case, if the patient has acute peritonitis, the abdomen is, I believe, always drawn backwards, but with occasional spasmodic contraction. This, I apprehend, is an illustration of the effect of the same nerves supplying the peritoneum supplying also the abdominal muscles. The irritation of the peritonitis causes the contraction of the abdominal muscles, and the sense of constriction or carrying backwards of the abdominal parietes towards the peritoneum.

A patient suffering from acute peritonitis always lies with the thigh bent upon the abdomen. There must be some reason for this, and I suppose it is for the purpose of removing tension, or rather, I should say, of removing opposition to the contraction of the abdominal muscles. I think the latter must be the true explanation of this position of the patient. This contraction may, in one sense, be regarded as a spontaneous effort on Nature's part to secure quiet and rest to the subjacent inflamed structures, suggestive, I think, of the value of fomentations strongly medicated with poppies and other anæsthetics, such as *belladonna*, *opium*, or *hemlock*. I had an opportunity of seeing this point well and practically exemplified, some years ago, by my friend Dr. Daldy. He asked me to see with him a patient—Sir Benjamin Brodie saw him afterwards—who had extensive cancer in the rectum. This gentleman had considerable pain in the colon, and spasmodic contraction of the abdominal walls associated with his rectal disease, and he suffered a great deal of pain at night, so as to deprive him of his sleep. For the purpose of procuring sleep, it was essential that he should take opium; it was administered by the mouth, but the opium thus taken destroyed his appetite. Here was a patient suffering from cancer, tight abdomen, and pain, and we were giving him opium, and destroying his appetite. Well, it was suggested that, instead of giving him opium by the mouth, we might possibly relieve him by rubbing the opium into the skin of the abdominal parietes. We accordingly had a strong solution of opium made, and rubbed it upon the abdominal parietes every night and morning. From that time the patient had scarcely any pain or spasmodic abdominal contraction; he required no more opium by the mouth to make him sleep, and he regained his appetite. This affords a clear exemplification of cause and effect in the local application of anæsthetics upon the exterior, leading to general repose or sleep, and actually nullifying or reducing the abdominal contraction and the pain. I believe this plan of treatment—I mean the application of anæsthetics to the cutaneous nerves—is, as a rule, most imperfectly carried out in practice.

We notice that, just in proportion as peritonitis subsides, so does the abdomen become softer, more movable by the hand, and less tight to the patient. If I have stated the facts and symptoms truthfully, we have

here evidence of the same muscular and cutaneous and serous association of nerves as is observed in regard to the nervous distribution to the joints, &c.

Let us now see how far we can apply this law to practice. Every surgeon knows that, after an operation for strangulated hernia, he need not make much difficulty about the general symptoms of peritonitis. He has merely to put his hand upon the abdomen: if he finds the abdomen soft and pliant, however much the patient may complain of pain, there is no peritonitis, unless it be one of very low form indeed, associated with pyæmia, or depressed condition of the system through the medium of poisoned blood, which would manifest itself by other symptoms.*

I do not mean to assert that a tight abdomen *per se* is indicative of peritonitis, because that may be the result of flatulency and a distended condition of the intestines, or hysteria. But in hysteria, although we may see great contraction of the abdominal muscles, that contraction is very irregular or unsteady. Sometimes it is in one part and sometimes in another, and upon gentle pressure it subsides. Tension which is associated with true peritonitis, so far as I know, never subsides under the influence of gentle or even of more severe pressure. Taking the analogy of a joint, we may say that the peritoneum represents the synovial membrane, and the abdominal muscles the muscles moving the joint; so that if we meet with an abdomen the muscular walls of which you can freely move over its contents, we may conclude that the peritoneum is not inflamed, just as, when we see that a joint is perfectly movable and without pain, we may be sure that the joint is really not inflamed.

Now, let me place before you another illustration from the upper part of the abdomen, above the umbilicus. Here we see the lower intercostal nerves, those which are associated with the false ribs after supplying the intercostals, passing through the edge of the diaphragm, or close to it, and then distributed to the abdominal muscles upon the upper part of the abdomen, and some going to the skin over the upper half of the abdomen. Here observe another relation between the cause and effect of a local inflammatory condition, which, if overlooked, leads to error in diagnosis, and the application of local remedies to the abdomen instead of the chest. In cases of costal pleurisy of the lower half of the chest, it is a common occurrence that the upper half of the abdominal parietes is tightly drawn backwards, and the skin over that part very tender to the touch, yet depending upon pleurisy of the lower half of the chest.

* It is not only in cases of pyæmia that peritonitis may be masked or latent. My experience has been that there is hardly any morbid condition which is taught and described as possessing signs so unmistakable, and yet which, when present, is so frequently not diagnosed. The traumatic cases which come under the notice of the surgeon are usually, perhaps, more clearly marked, but here, too, the presence of peritonitis may be masked. Thus a patient who had been the subject of constitutional syphilis had what proved to be a gummatous tumor in his liver; this was diagnosed as a tumor in the right rectus, and an operation undertaken for its removal. After this the patient gradually sank, but during the time that intervened between the operation and the close of his life (three days) there was scarcely any evidence of peritonitis, though after death this was found to be clearly marked and abundant. So, too, in strangulated hernia, as in a case of femoral hernia in which I lately had occasion to operate, the patient may sink with latent peritonitis, and complain of no pain whatever to the last. In diagnosing the existence of this condition, a sudden rise of temperature, abdominal distention, especially a tympanitis which stealthily but steadily increases, and a gradual pinching of the features, would appear to be far more trustworthy than pain, a symptom which, on account of its not infrequent absence, seems to me to be an unreliable one.—[Ed.]

Here also we have an exemplification of the same nerve supplying the muscles, the skin over the muscles, and the peritoneum associated with these muscles. The pathological cause, in pleuritic inflammation, is within the chest, yet the abdominal muscles are very much employed in respiration, and the nerves supplying them supply also the skin over the surface of the same muscles. But I never like to mention a fact of this kind in normal anatomy without fixing upon it some point in practice. It has been my habit through professional life to make this practical combination.

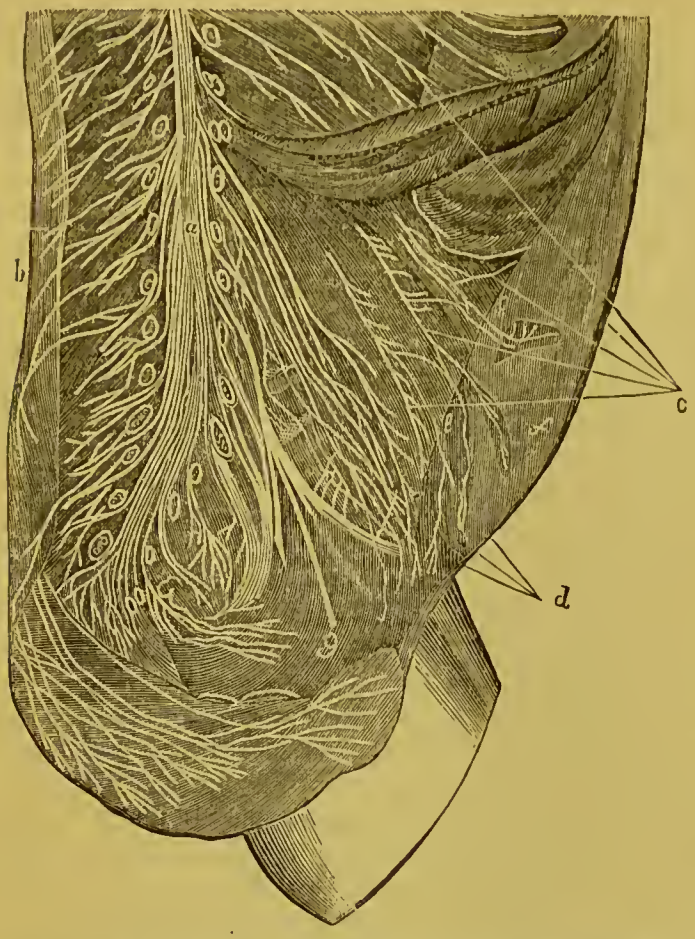


FIG. 50.—This sketch is taken from Mr. Swan's work on the Nerves. *a*, Spinal marrow. *b*, Posterior filaments of spinal nerves, proceeding to the muscles and skin of the loins. *c*, The lines, radiating from this letter, proceed to the lower intercostal nerves, which are seen descending from above the diaphragm to reach their distribution in the muscles of the upper half of the abdominal walls and the overlying skin. *d*, Lumbar nerves proceeding to the lower portion of the abdominal wall and the skin. *e e*, Anterior abdominal wall. *f*, Rectus abdominis muscle. *g*, Obturator nerve. *h*, Diaphragm.

In July, 1860, a gentleman, aged twenty-two, whom I had previously known, came to me, looking very ill. After a little detail, he said, "I have been very ill for some time. I have had such pain and spasm in my belly. I believe there is something wrong about my liver. And then my stomach has been getting bad. I have been treated for disease of the colon, I think you call it, and various other things, but I am not a bit better." I inquired of him, "Are the pains on both sides?" "Yes," he said, "the pains are here," placing his two hands over the pit of his stomach; "both sides alike." Having just before that time been lecturing upon the symptoms of diseased spine, it struck me, at first, it was a case of that disease. I accordingly examined his spine, but I could find no cause there. I stated in a previous lecture that whenever we meet with an instance of symmetrical pains, the cause is either central or bilateral. Well, not finding a diseased spine, I questioned him further, and he said, "I cannot lie down in bed on either side, and in going up-stairs I can hardly get my breath." I then thought I was upon the confines of a medical case, and ventured to percuss the chest, and recognized marked dulness on percussion. On applying my ear, I could recognize altered respiratory sounds. He had a collection of fluid in each pleura. The whole thing was now explained. He had had these pains and cramps in the upper half of his abdomen, which misled his previous attendant, and induced him to concentrate his atten-

tion—which he did, I must say, with great energy—upon the viscera lying immediately under the upper half of the abdominal parietes. But the treatment was altogether misplaced. I directed this gentleman to be well and repeatedly blistered upon the chest, and so we got rid of the fluid. Here, then, is an instance where the same nerves which supply the muscles supply the skin over the muscles, and where the local manifestation of the painful symptoms was remote from the real cause of the symptoms. Through the medium of this nervous association and supply, and the symmetrical development of the pains, I came pretty accurately and quickly to the real cause; and we know perfectly well that, whether in medicine or surgery, nine-tenths of successful practice depends upon accurate diagnosis. I may here mention an additional circumstance of interest, that the upper half of the abdominal parietes overlap or cover those abdominal viscera which seem to be importantly influenced by the process of respiration—the liver, and perhaps the stomach, but the liver especially. The liver lies between the diaphragm and the abdominal parietes, and must be subjected to their pressure, which aids the hepatic circulation, especially when these two muscular structures are being actively occupied in the process of respiration. I have mentioned this subject before, and stated that the abdominal viscera are very likely to suffer from congestion when plethoric persons are suddenly confined to bed by accident, thus losing the opportunity of free respiration. Under such circumstances the liver is especially liable to congestion, sometimes leading to jaundice.

If we look to the relation of the pericardium and diaphragm, we discover a correspondence in the distribution of the nerves which appears quite analogous to that which we find in the muscular apparatus moving a joint. May we not consider the fibrous pericardium as part of the fascial insertion of the muscular diaphragm? The pericardium is most intimately blended with the diaphragm, distinctly identified with it, and capable of being acted upon by it at all times. It is also attached above to the deep cervical fascia. It is thus kept tense by the action of the respiratory muscles in the neck attached to the cervical fascia above, and the diaphragm attached to it below; or, in other words, these two muscular forces are acting on the interposed pericardium in opposite directions, and so render it tense and resisting. And the special object, no doubt, of this piece of anatomy is that during a full inspiration, when the lungs are distended with air and the right side of the heart gorged with blood from a suspension of respiration, the heart should not be encroached upon by the surrounding lungs. Here one observes a peculiar circumstance. How extraordinary it is that the phrenic nerve (a nerve so important to life) can pass through the chest between the dilated heart and the distended and expanded lungs, and yet, as far as we know, never receive any untoward influence from pressure? It is true the normal healthy lungs have, as I demonstrated long since, a remarkably definite concave form towards the heart, arching over the course of the phrenic nerve; but when the lungs are emphysematous, it seems to me quite probable that these nerves might suffer from pressure, and cause some difficulty in breathing. I pointed out some years ago how it was, when extravasation of air occurs from rupture of the trachea or a large bronchial tube, that the patient died rapidly, and with extreme shortness of breath. The extravasated air enters the track of the phrenic nerve, thus causing extreme pressure on the nerve, and, by destroying the power of the diaphragm, leads to the rapid death of the patient. Let us trace these nerves below the diaphragm. The

phrenic nerve, in its course from the neck, passes through the chest, ultimately reaches the diaphragm, and is then distributed upon the inferior aspect of that muscle. Now physicians tell us that if a patient has pericarditis, there is always a sense of oppression at the epigastrium. Some say there is a catch in the breath apparently associated with the diaphragm.

I must not dwell upon this subject, but I ought to have said that this phrenic nerve gives off a small branch as it passes along the middle mediastinum to the pericardium. I am not prepared to say, but I think it is probable, that this may be a sensitive filament of the phrenic nerve; and if so, we have the analogy to a joint pretty well completed. We have the diaphragm, representing the muscular apparatus; we have the serous pericardium, representing the synovial membrane; we have the fibrous pericardium, representing the capsular ligament, and all capsular ligaments have muscles attached to them. We have then, analogically, the representatives of a joint. Although time will not allow me to extend this subject, I may remind you that we thus have an explanation of the sense of constriction and tightness and shortness of breath of which patients suffering from pericarditis usually complain, if through the medium of a cutaneous or sensitive filament going to the pericardium, pericarditis can produce muscular spasm, or contraction of the diaphragm, precisely as the nerves in the interior of an inflamed joint can lead to the muscular spasm of that joint.

LECTURE XI.

Cutaneous and Muscular Nerve Distribution in Relation to the Pleura—Application to the Treatment of Inflamed Pleura—Mechanical and Physiological Rest as applied to the Treatment of Pericarditis—Analogy between the Effusion of Lymph by a Serous Membrane and the Production of Callus in a Fracture—Swollen Joint a Means Taken by Nature to Procure Rest for the Part—Rest Illustrated in the Treatment, Natural and Artificial, of Injury to the Eye—Nerve Distribution of the Mucous Membranes—Practical Application—Chronic Cystitis Relieved by Opium Inducing Physiological Rest—Other Examples—Cure for Onanism.

I WILL now proceed to consider briefly the anatomy of the upper intercostal nerves, for the purpose of explaining the same anatomical law of distribution with regard to the pleura which we have considered in reference to the peritoneum and the pericardium. We observe that the same intercostal nerves which supply the intercostal muscles moving the ribs supply also the serous membrane lining the thoracic parietes and the skin over those different but physiologically associated structures, in order to produce harmonious and concerted action during the varied states of respiration. Here, then, we have the pleura representing the synovial membrane; the intercostal muscles representing the muscular apparatus connected with and moving a joint; and the cutaneous branches of the nerves spread over the intercostal muscles, assimilating in their arrangement to the cutaneous branches which supply the skin over the insertions of the muscles moving the joint.

But this physiological anatomy, without some application to practice, would, perhaps, be scarcely worth dwelling upon.

Pleurisy of the pleura costalis, at the upper part of the chest, is often accompanied by pain and tenderness of the skin not only over the seat of the pleurisy, but also in the axilla, and over the front of the shoulder, resulting from the course and the peripheral distribution of the intercostal nerves.

It will be recollected that some filaments of the intercostal nerves pass through the walls of the chest to the skin covering it, and that some cross the axilla, and are then distributed to the skin of the front of the shoulder and the inner side of the upper arm; hence the pain and tenderness in these parts resulting from pleurisy. We may here discover illustrative instances of pain on the surface of the body from internal causes, corresponding in principle with the remote pains associated with some cases of diseased joints; as, for example, the pain in the knee associated with hip-joint disease, or as in disease of the spine, where the pain is expressed at the cutaneous extremity of the nerves escaping from the part of the spine actually diseased. In all these cases the absence of the evidence of local inflammation clearly indicates that the pathological cause is not at the part where the pain is expressed, but somewhere in the course of the nerve proceeding from the real seat of disease to this part.

It may be noticed that persistent pain on the surface of the upper and posterior part of the chest, and upon the anterior part of the sternum is

not unfrequently associated with disease of the heart or large blood-vessels. Indeed, I think I might generalize on this part of my subject, and make an artificial division of the back into three compartments. First, *high up between the shoulders*, where persistent pains—pains of nervous continuity—as a rule, coexist with disease of the heart, aneurism of the aorta, disease at the bifurcation of the trachea and bronchi, diseased glands, or stricture of the œsophagus within the posterior mediastinum; second, *between the middle and lower part of the scapulæ and a little lower down*, where the existence of like pains are most frequently associated with disease in the abdominal digestive viscera, and, I think, the transverse colon, through the medium of the great splanchnic and the intercostal nerves—(I believe I have seen some cases of disease of the transverse colon where the patients have had these lower interscapular pains); third, *the surface in the lumbar region*, where the pains are more distinctly associated with local disease in the loins, such as disease of the ascending or descending colon, the kidneys, lumbar lymphatic glands, spermatic nerves, and testicles.

Patients suffering from cancer of the breasts often complain of pain in the back, between the shoulders, or on the side of the chest, sometimes down the inner side of the arm and across the axilla. In such cases we not unfrequently find cancer tubercles under the pleura costalis, or cancerous glands in the axilla, or in the posterior mediastinum. Such remote sympathetic pains occurring a long way from the real disturbing cause are explained by the course of the intercostal nerves.

These superficial pains, although depending upon a remote cause, may sometimes be relieved by local anæsthetics, as prussic acid, hemlock, belladonna, and opium. Some few years ago I saw this point well exemplified in practice. Dr. Munk asked me to see a young lady with him who was suffering and likely to die from pulmonary tubercular consumption. I saw the lady at the Bank of England, and found that her complaint (for which I was consulted) was pain and tenderness of the skin in the armpit, the shoulder, and down the arm on the right side; these pains were excessively distressing to her. Upon examination, I found she had had a large abscess in the right armpit, and upon lifting the arm from her side, and looking through an ulcerated opening in the skin, I saw the little cords of intercostal nerves denuded of areolar tissue, and proceeding across the axilla towards the superficial parts, where her pains were expressed; and when I touched the exposed nerves with a probe I induced a great increase in the severity of these pains. I recommended that all the skin whereon the pain was expressed should be thickly covered with the extract of belladonna spread upon soft leather, and that the arm should be kept quiet by being bandaged to her side. By these means the patient was very much relieved from the pain and tenderness during the remaining short period of her life.

I would venture hypothetically to apply the following explanation to the painful effects resulting from the local application of cold air upon the peripheral branches of the intercostal nerves. I believe that the local influence of cold air may be sufficient to explain the occurrence of *stitch, or that cramp in the muscles of the chest* which prevents a full inspiration, by inducing tonic or spasmodic contraction of the intercostal muscles which are supplied by the same nerves (the intercostals) which supply the skin upon which the cold is applied. This explanation will hardly be deemed untenable, when I remind you that if a patient faints, we, anxious to excite respiration as quickly as possible, throw cold water over the face,

or denude the chest and flip its surface with a wet towel, and throw cold water abruptly upon the walls of the chest. And we do it for what purpose? It cannot be for the direct application of cold to the muscles themselves. It must be for the purpose of exciting the muscular apparatus which moves the walls of the chest, through the medium of the local application of cold to the cutaneous nerves.

Hitherto I have been looking at this associated anatomy chiefly in relation to symptoms leading from without to within. Now let us regard it from within to without, and see what external symptoms an inflammatory condition of the interior of the chest and pleura ought to bring about, and the suggestions which might arise in reference to our subject of rest as applied to them.

May not the irritation of an inflamed pleura bring on a contracted condition of the muscles between the ribs (intercostals), and thus engender the limited breathing and the painful cramps and stitches from which such patients suffer, in addition to that which results directly from any local inflammation of the pleura, and which induces pleuritic patients to limit their respiration as far as possible to the action of the diaphragm? This spasmodic contraction of the intercostal muscles, induced by the inflammatory condition of the pleura, is precisely analogous to what we see in joint disease. When the synovial membrane is inflamed, the joint is always fixed and rigid, and difficult to move. If the pleura be inflamed, we ought not to be surprised if we find its muscular apparatus in a like condition, excited to powerful contraction and a spasmodic condition from the association between the synovial membrane and the muscles. This seems to me a very probable explanation. What should we do, then, if we had an inflamed joint? We should first keep it quiet by not using it. Do not use an inflamed pleura, then, I say; do not induce a patient to take a full breath; do not permit him to carry on any long-continued conversation, taking in a full breath, and gradually streaming it out in a large number of words and sentences. If we have an inflamed joint, we apply anæsthetic fomentations to its exterior. We know by experience that if we apply strong poppy or opium fomentations, hemlock or belladonna poultices, or anæsthetic embrocations, upon the exterior of the chest, in these inflammatory conditions of the interior, they give a great amount of relief through the medium of their influence upon the intercostal nerves which come to the surface. If a joint be inflamed, we put a splint upon it to keep it at rest. Why not strap or bandage the chest in cases of pleurisy when the acute mischief has passed off? Surely it would have the tendency to subdue the inflammatory condition by preventing any friction between the two opposite pleural surfaces.

All surgeons must have observed, in cases of pleurisy, that if the patients be asked to take a full breath, to raise the ribs and expand the lungs, they cannot do so without suffering pain. This is surely very suggestive of the importance of rest, and points to the value of strapping the chest in cases of acute or chronic pleurisy, with or without fractures of ribs (I have no doubt about its great utility in the latter complication); for it not only keeps the ribs quiet, but prevents any friction of the pulmonary pleura upon the inflamed pleura costalis.

These observations of course suggest another practical lesson—never to allow a patient suffering from pleurisy or pneumonia to talk or to answer questions except by monosyllables, so as to avoid a full inspiration. Let the patient write all his or her wishes upon a slate. This may appear a small item in practice; but I could mention several instances where this

little element has been the turning-point in the case. A physician, residing not very far from me, had under his care a patient who had received a blow upon his chest by a fall upon the part; and as he was after several days still suffering a good deal of pain in breathing, the physician asked me to see him in reference to the possibility of fractured ribs. I could find no fracture; but I observed that the patient had a most worrying wife. She was incessantly talking to him day and night, and there were continual contentions between them upon domestic affairs. I suggested to the physician that the sole cause of the pain was in all probability produced by the patient constantly moving the injured or bruised soft parts by using his chest and lungs in speaking. All I recommended was, that he should hold his tongue and have his chest bandaged. I requested that his wife would not say a word to him, but would provide him with a slate and pencil so that he might write down all his desires. From that time he got quickly well *by local rest.*

I think it is a fair common-sense deduction, that if we can keep the inflamed pleura perfectly quiet, and prevent it suffering the ill effects of undue friction, we certainly must contribute something towards arresting the continuance of the inflammatory condition. I do not think this important subject is usually considered in this light; and I am convinced that it ought to receive a larger amount of attention than it has done.

Again, with respect to the application of local anæsthetics to the outside of the chest. I think I have shown that we have a power of acting upon the walls of the chest and the muscles of respiration through the medium of anæsthetics applied to the cutaneous nerves associated with the nerves of the pleura costalis; but I admit we have very little opportunity of acting directly upon the heart or pericardium through the external or cutaneous nerves associated with the cardiac nerves, so as to induce physiological rest in that organ by the external application of anæsthetics. You will be impressed with this conclusion when I remind you that there are but a few filaments of the upper intercostal spinal nerves which join the cardiac plexus of the sympathetic nerve within the chest; and that these same intercostal nerves distribute only a small number of cutaneous filaments to the skin of the chest and back. It must not, however, be overlooked, that the cervical spinal nerves communicate with the cardiac nerves derived from the sympathetic ganglia in the neck. These are apparently the only nerve-tracks extending from the surface of the body to the heart which would permit of direct anæsthetic influence being propagated from the skin to the heart.

Let us now see whether the subject of "mechanical and physiological rest" can be made therapeutically available in reference to the treatment of acute pericarditis. The physician cannot fail to admit that, whilst treating pericarditis, he has to deal with a membrane investing and surrounding an organ with whose functions complete rest is incompatible, since the rhythmical movement of the heart is necessary to the persistence of life. Yet he must allow that it is only through the medium of lessened action and diminished distention of this organ, with a concurrent lax condition of the diaphragm and pericardium, that he can expect to obtain any relief from friction to the serous membrane itself. Allow me, then, to put before you this suggestive question: whether, in a case of acute pericarditis, it would be possible to over-estimate the value of local rest as a therapeutic agent? We, as surgeons, see the ill effects of friction upon inflamed parts—as in cases of inflamed joints, of inflamed ulcers, inflamed conjunctivæ, inflamed skin, &c. Hence we may fairly assume that

friction upon the two free and inflamed surfaces, as in the early stage of pericarditis, must add materially to the local mischief, and tend to keep up the inflammatory condition.

I assume—for it is not from direct clinical experience that I speak—that the physician's first anxiety is to quiet the action of the heart, to reduce the frequency of its pulsations, to diminish its muscular excitability, and thus to moderate the friction and its ill effect. I may venture, in addition, hypothetically to imagine that he would desire even to stop the movements of the heart for a time, for the purpose of preventing friction, provided that its arrest was compatible with life, or that he had the power to insure the resumption of its activity. But although this direct influence is beyond the limits of human power, yet I think we discover that the treatment adopted in such cases is founded upon the principle of giving all possible rest to the heart. Venesection, antimony, opium, digitalis, are, or have been, I apprehend, resorted to for this purpose, or, if not employed with this precise view, I conceive that their beneficial influence is to be traced in part to their insuring less frequent and less rough friction between the two surfaces of the pericardium, by diminishing both the distention of the heart and the rapidity of its action.

With a view to the full and further appreciation of rest in idiopathic pericarditis, let us admit, for the sake of illustration, what I believe to be the right interpretation, that the effusion of lymph in this pericarditis results from some morbid condition in the blood. When this condition of the blood has been exhausted by the inflammatory pericardial effusion, or has been eliminated by Nature through some emunctory, such as the kidney or some other organ, aided by medicine, may we not discover some good in the solid plastic effusion itself? I think we may—in the induced rest.

What is the mechanical influence of the effused lymph (which may or may not glue the two pericardial surfaces together) upon the serous surfaces, which are not only secreting, but also absorbing? For it must be borne in mind, in anticipation of what I shall presently remark, that serous membranes are rapidly absorbing organs. I have no hesitation in saying, from both clinical observation and experiment, that these serous membranes are very rapidly absorbing organs indeed. Observe this illustrative case of absorption by the peritoneum. Suppose a person has an injury to the abdomen, which causes an extravasation of a large quantity of blood into the peritoneum. This blood consists of a certain amount of serum and coagulable blood. Now, if the patient survive but a few hours, what do you find in the abdomen after death? No serum; every drop of it is gone. Gone where? All of it is absorbed. The clot of blood remains, but the fluid part of it has been taken up. There is no doubt that solid effusion has been known to exist during life between the pericardial surfaces, recognized by certain diagnostic sounds which have subsequently ceased; and the patient dying some time afterwards, the post-mortem has proved that the whole of the lymph had disappeared, no doubt by absorption.

The result of the effusion of the inflammatory fluid is, that the serous surfaces become defended immediately from direct and intimate surface-friction; thus that possible source of irritation is removed. Thenceforward this acquired rest, or freedom from direct friction, enables the serous membrane to recover itself, and then to resume its important function of absorption. So, too, in other parts of the body. For example, in the case of croup, when effusion of lymph takes place, the false membrane adheres

for a time to the mucous membrane; the mucous membrane thus obtains a physiological rest, and the little glandular structures, imbedded in the submucous tissue, recover their strength through their physiological repose. They then renew their function of secretion, and thus detach the false membrane. I think I might with reason compare (in relation to the subject of rest) the effusion of lymph in pericarditis to the "provisional" callus formed by Nature in cases of bad fractures. There is no doubt that the longer the inflammation of the pericardium continues, the more unhealthy the membrane becomes, so that if inflammation of the pericardium becomes chronic or enduring, the pericardium acquires such an unhealthy condition that it will not perform its second function of absorption. Patients so affected are those who die with a large quantity of fluid in the interior of the pericardium, constituting dropsy of the pericardium. Thus, if fluid be poured into a healthy pericardium, it is rapidly absorbed; if into a very unhealthy one, no absorption takes place, and those dropsies occur that we so often see.

We observe the curative principle of acquired rest displayed in other parts of the body when suffering from inflammation, such as the occurrence of solid effusion (callus) associated with the repair of some fractures of bones, and the massive swellings which we see incumbering the exterior of inflamed joints, whether in cases of acute or of chronic destructive inflammation of the interior of a joint; the joint still, perhaps, going on to repair. When a bone is fractured, what do you discover upon the exterior of the fracture, when the fractured pieces are subjected to frequent local disturbance? We know that Nature herself puts a splint upon the exterior of the bone, including the fracture, for the purpose of keeping the fractured ends of the bone in actual rest, and that, in truth, this external splint is developed in proportion to the amount of movement to which the fragments have been subjected.

I saw a most instructive case of this kind some years ago, which made a great impression upon my mind. On Sept. 3rd, 1845, Mary Ann L——, aged thirty, washerwoman and ironer, attended as an out-patient at Guy's Hospital. She had a hard swelling, as large as a moderate-sized orange, in the middle of the right clavicle, supposed to be exostosis or malignant disease of the bone. She told me that she thought she hurt it six weeks before, as she felt a sudden pain in the swollen part whilst trying to stop the fall of a chest of drawers. In a few days the part began to swell, and continued to do so up to the time I saw her. A blister had been applied by a surgeon ten days before, without any apparent advantage. Thinking it a case of disease or new growth in the bone, I ordered her to rub the compound iodine ointment freely into the tumor, and to take some ammonia and bark; and, having fixed her arm in a sling, I enjoined her not to use it, or make exertion of any kind, for she always had pain in the swollen part of the collar-bone when she did so. I saw this woman again in three weeks, and the tumor was a little reduced; and I was congratulating myself with the idea that here was a case of malignant disease being cured by iodide of potassium. From that time I lost sight of her. Being anxious and determined to know the result, on the 24th of May, 1847, I went with Mr. Chabot to the houses of nearly all the washerwomen in Camberwell, and we at length discovered her. I examined the clavicle. There was a slight overlapping of the fractured ends of the bone, but the bone was consolidated. It was thus clear that she had had a broken clavicle, and what I had treated was the callus of a fracture. She told me that the swelling went away gradually after a few weeks, and she

found she could resume her duties at the wash-tub and ironing-board without pain. It thus appeared that by fixing the arm I had secured rest to the fractured bone, the neeessity for that amount of callus whieh Nature had supplied for the purpose of securing rest to the fracture was dispensed with, and then the callus disappeared without any further treatment.

This natural process for the purpose of securing rest to a fracture is perfectly analogous in its effects to the effusion of solid lymph which occurs between two inflamed serous surfaces. The function of the external callus, associated with fracture, is only temporary, for as soon as the fractured ends become harmoniously and mutually consolidated it disappears. Its purpose is merely to maintain the fractured ends of the bone in a state of quietude and rest, so that Nature may go on with her perfect work of exact repair without the fractured ends being moved upon each other, or in any way disturbed. In a case of doubtful fraeture of a bone I have seen this subjet thus brought forward in a court of justice. A counsel has asked a surgeon this question, "Would you say that the plaintiff has had a fraeture, seeing that you find no callus?" And the answer has been, "No, I should say there was no fracture, because there is no callus." Another surgeon, perhaps, is put in the witness-box, and he says, in answer to the same question, "I deelare positively that the fact of there being no callus is to my mind the best evidence which could be adduced of the perfeet treatment of the fracture by the surgeon." Now, the fact of the absenee of callus is, no doubt, the highest praise that can be won in the treatment of a fracture by the surgeon, who had adjusted the fractured ends so eompletely, that there was no necessity for Nature's splint or callus to secure meehanical rest to the ends of the bone.

This same physiological point is also well displayed, in practice, in the occurrence of the thickening of soft struetures external to inflamed or diseased joints. This thickening has the decided effect of giving mechanical rest to the interior of the joint, tending to steady it, to support it, to render it comparatively immovable, and to oppose disturbance by museular contraction, showing the value which Nature attaches to rest as a curative agent. How conspieuously striking is the changed configuration of the inflamed joint when the inflammatory eondition has subsided, when the joint has recovered itself, or when the disease has resulted in membranous or bony union of the articular surfaces? Then it is that we may notice with admiring wonder the steady and sure removal by Nature herself of the external adventitious matter as a thing now unnecessary, and as being no longer required by the joint for its rest. So it is with the solid effusions which are intended to eireumscribe the inflammatory abscess; it is noticeable that as soon as such an abseess is opened, the necessity for the deposit around it no longer exists, and it is absorbed. Thus, I think, we may by analogy see the evidence of the beneficial influence of rest in the treatment of pericarditis; and we may diseover some good to be derived from the inflammatory effusion by its giving rest to the pericardium for a time, and enabling it to resume its other funetion of absorption. By considering the subject of solid effusions associated with local inflammation in this light, we recognize the folly of the surgeon who attempts to get rid of the external callus of a fracture so long as the fractured bone is not united; likewise, the folly of expecting to get rid of the surrounding swelling associated with chronic joint diseases before the joints themselves are repaired; in fact, it cannot be done.

Having examined the distribution of associated nerves in the joints

and serous memoranes, and pointed out some of its results as evidenced in the symptoms induced by it in the diseases of those parts, I now purpose to consider briefly the same anatomical and functional arrangements as they are manifested in the mucous membranes and their directly associated muscles. Let us look, for instance, at the conjunctiva, the orbicularis palpebrarum, and the skin covering the eyelid, in their due anatomical and physiological relations. These parts stand very much in the same relation to each other as the synovial membrane of a joint, the muscular apparatus moving that joint, and the skin over the insertions of the muscles. We find that the facial nerve is one of the motor subdivisions of the great cranial compound nerve constituted by the large origin of the fifth nerve, as the sensitive root, and the third, fourth, fifth (motor portion), sixth, and seventh cranial nerves, which together form the motor roots of this cranial nerve; the whole of this nerve association structurally resembling a common two-rooted spinal nerve. The sensitive root of the fifth nerve supplies the conjunctiva and skin with sensation, and the facial nerve supplies the orbicularis palpebrarum, the muscular apparatus, with motor power: these two nerves are most intimately associated both anatomically and physiologically; hence the constant and active sympathy between these parts. Now notice what happens when the eye is inflamed, or the light is too strong for the eye. The eyelids are immediately closed—the eye is placed in darkness, which is the eye's "rest." Here is an indication on the part of Nature which has been visible to mankind from one generation to another, and soliciting, as it were, apprehension; yet how little is it appreciated, how rarely made the guide of practice! Surely the neglect of such an indication is a great error, and requires correction. If the eye be inflamed (painful, irritable, red, congested, very sensitive) by exposure to a strong, glaring light or to intense heat, immediately the eyelids are instinctively closed, thus adopting the principle of rest as a means of restoration. Tears are secreted, analogous to synovial secretions in joint inflammations, to lubricate the conjunctival membrane, to interpose a layer of fluid between the globe and eyelids, to prevent direct friction of the two mucous surfaces, and possibly to foment the eye. If the eye be thus kept in temporary darkness, free from friction, and thus rested, it will return in a few hours to its normal state without any other aid.

It is certainly an interesting and most instructive fact, and well worthy of distinct notice here, that the portion of the body in which Nature displays most conspicuously her immediate appreciation of the value of rest in relation to its restorative power is the organ of vision—the part of the human body, be it remarked, the most completely under the fullest observation of the surgeon, with the least amount of trouble, and where he may see the evidence of the good to be derived from rest to the diseased or injured organ most graphically expressed. I suppose every living professional man of every grade, of every age, whether his intellectual acquirements be great or small, would advise the exclusion of light from an inflamed eye. This in reality is giving perfect rest to the organ, by removing that natural stimulus, which in excess becomes a great source of excitement. But I must add, as a stigma and opprobrium upon the mental perception of some of us, that although we recognize the law and the principle as applicable to the eye, we do not appear to see it so clearly, and certainly do not act upon it with the same fixed notions and the same precision in its application to the other parts of the body when suffering from accident or disease. If the eye be inflamed, the first thing

that happens is that the eye becomes placed in darkness in a dark chamber. Well, if you admit darkness as necessary or important in the treatment of diseases of the eye, you will be compelled to admit as a principle the therapeutic value of rest in the treatment of diseases of the joints, and indeed in all inflamed parts. The other day I received from India this note from an old dresser of mine:—

"*Apropos* of your subject of rest: Do you remember in 1857 little J. G—— burning his face and eye with gunpowder? I got great credit for my skill in that case, and pocketed it; but the credit was really due to you in having instilled into my mind a deep-rooted idea of the importance of rest in surgical practice. J. G—— was letting off a squib; the powder did not ignite well, and he lowered his face close to it, and blew to kindle the flame, which he succeeded in doing, and in an instant the squib exploded, burning his face and eye. I saw him almost immediately, and found him in excruciating agony; the face darkened, skin ingrained with gunpowder, the conjunctiva of one eye black, and looking puffy and half roasted. The cornea had a peculiar appearance; the outer lamina and conjunctiva over it had shrivelled, presenting an uneven, opaque surface (pretty much resembling the appearance of a cornea that has been so compressed after death as to have had its laminar structure irregularly displaced, and so become opaque), with a sooty dust ingrained and deeply pitted on its surface. The eye was washed with warm water, the lid then closed down, a drop of sweet oil having been first inserted under the lid, and a piece of plaster applied to keep the lid closed, but not to press upon the eye. The other eye was then also closed. Two days afterwards the inner canthus was washed with warm water, but the eye not opened. On the fifth day I opened the lid, and found the cornea bright and clear, and a new and healthy layer of epithelium covering the entire globe. Under the influence of rest, healthy nutrition had effected complete repair." This patient got quickly well.

Observe the effect of morbid action in another portion of the mucous membrane, in order to mark this same nerve distribution. If you have an inflamed throat with inflamed tonsils, are you not constantly, in spite of yourself, swallowing and producing pain in the throat which you would be glad to avoid? What is it that incites this involuntary act of deglutition? It is an irritated or inflamed condition of the mucous membrane of the pharynx and palate which excites the associated muscular apparatus, through the medium of the glosso-pharyngeal and the pneumogastric nerves. You are constantly forcing and rubbing the inflamed tonsils, pharynx, and palate upon each other; and thus "swallowing" is excited frequently, painfully, and against your will. This is exactly the same thing as irritation or inflammation of the synovial membrane producing contraction or spasm of the muscles moving the joint. This kind of case is best relieved by the local application of opium—by painting the throat with a solution of opium.

Some time ago I saw, with Dr. Herbert Davies, of Finsbury Square, a gentleman who could scarcely swallow at all, for, directly he put fluid into his throat, it produced a violent and choking spasm. He was then nourished by nutritive enemata. I saw him endeavor to swallow fluid, but he nearly choked himself. I touched his throat with a camel's-hair brush, and a violent spasm was produced in the pharynx and larynx. Numerous and different gargles, weak and strong solutions of nitrate of silver, had been well employed, but without any advantage, and the patient was rapidly emaciating. I advised the use of a powerful anæsthetic to the irri-

table mucous membrane. I requested him to use a gargle containing prussic acid. From the first time he adopted this plan of treatment he began to improve, and ultimately recovered. This application of prussic acid was adopted on physiological principles, merely for the purpose of reducing the sensibility and irritability of the mucous membrane, and of putting an arrest to the associated spasmodic contraction of the muscles. Subsequently this patient went to Hastings, and there the pharynx was painted with a solution of chloroform, upon the same principle of indueing physiological rest to the throat, and he got quite well.

Now take the larynx for illustration. Both the sensitive and motor nerves of the larynx are derived from the same pneumogastric trunk, and hence we note that any irritation or inflammation existing upon the mucous surface of the larynx or of the laryngeal surface of the epiglottis induces excited muscular action immediately on the part of the associated laryngeal muscles. This irritable state of the larynx is usually treated by the local application of nitrate of silver in solution, or in the form of a very fine powder, which is blown into the larynx; and the relief is sometimes very complete and speedy, by the physiological rest which it gives to the mucous membrane. I apprehend that rest is afforded by the nitrate of silver acting upon the mueus and albumen, forming a solid albuminate of silver, constituting an adherent temporary covering to the mucous membrane; thus giving it rest by defending it from the atmospheric air, and so destroying for a time that nervous irritability and muscular contraction which produce a sense of suffoeation. After all, the produetion of physiological rest is the curative principle, based upon the fact that the same nerve-trunk supplies both the mucous membrane and the muscular apparatus of the larynx.

This principle of nerve distribution obtains throughout the whole distribution of the pneumogastric nerve, viz. the same trunk of nerve supplies the mucous membrane and the associated muscular apparatus. It is the same with respect to the intestinal canal: the mucous membrane and muscular walls are supplied by the same nerves, causing direct sympathy between them. I have no doubt in the world that the effeet of most purgative medieines is to induce irritation and increased secretion from the mucous membrane, and increased museular eontraction in the walls of the intestines. I must therefore express my conviction that the frequently repeated introduction of irritating medicines into the bowels is very likely to do a great deal of injury by exciting muscular eontraetion, and thence diminishing the calibre of the gut; and that subsequently a great length of time, with carefully managed diet, is required to replace the intestines in a perfectly healthy condition. The continuous administration of purgative medicines is on this account, I apprehend, very often most injudicious.

The muscular urinary bladder, with its mucous membrane and nervous supply, offers another example of this nervous distribution. We see this exemplified in a patient who has in his urinary bladder a stone, causing a great deal of increasing irritation, with frequent desire to pass his water. How is this condition to be explained? It obviously depends upon the fact that the same nerve that supplies the mucous membrane supplies also the muscular apparatus of the bladder. Hence the stone, by annoying the mucous membrane, becomes a constant source of excitation, which eauses contraction of the muscular walls of the bladder. Thus it happens that the bladder beeomes in some instances so exceedingly diminished in its capacity, and so contracted upon the stone, as to leave scarce any room for urine, and hence the frequent mieturition. If the stone be removed,

the local irritation subsides; and then the capacity of the bladder is restored. In cases of irritable and painful bladder, my colleague, Mr. Cock, has long been in the habit of injecting sedative solution of opium into the interior of the bladder, with great advantage to the patient's condition; and I have repeatedly observed the good effect arising from such a proceeding myself. Here is a case in point.

Chronic Cystitis relieved by Opium Injections, inducing "physiological rest."

A woman, aged seventy-four, came under my care June 27th, 1860. Twelve months previously she noticed that her urine contained blood, which was sometimes bright, sometimes dark and coffee-colored; there was also great pain, extending up to the umbilicus, of a "cutting" or "twisting" character. The urine seemed to scald the external parts, and she had great irritability of the bladder, passing urine every five or ten minutes. These symptoms had continued with increasing severity up to the time of admission. She had become very thin, and had lost her appetite; she slept very badly, and her bowels were usually confined. There was slight tenderness a little to the left of the umbilicus, and on deep pressure towards the left loin, but no pain in the loins or evidence of disease of the kidneys. The vagina and vulva were healthy, except that there was a small, but not painful, growth at the meatus urinarius. There was no tenderness over the bladder or in the vagina. No calculus existed in the bladder; the urine was ammoniacal, and contained phosphatic deposits, with blood and muco-pus; no cancer cells could be detected in it. Rectum healthy. There were one or two enlarged and rather hard inguinal glands on the right side. On June 28th she was ordered an injection of fifteen drops of the sedative solution of opium in half an ounce of mucilage. The bladder was emptied of its urine by the catheter twice daily, and the injection then thrown in. Five grains of Dover's powder were taken three times a day. Almost immediately she began to be relieved, and this is the report of her condition after four days of this treatment:—"The urine has now become clear and free from blood and pus, and on one occasion was neutral. She still has some pain during and after micturition, but the bladder is much less irritable; she can now retain her urine sometimes for an hour." This patient was finally much relieved by the opium injections.

This, then, is a case indicating the value of recognizing the anatomical distribution of motor and sensitive nerves, and of employing local anæsthetics. There is nothing more remarkable in introducing opium into an inflamed and irritable urinary bladder, to relieve its irritability, than there is in applying a hemlock poultice to an inflamed joint to reduce its sensibility, or a belladonna plaster over the exterior of a painful shoulder, or dropping a solution of sulphate of atropia upon the conjunctiva to relieve the pain and muscular contraction of the iris in iritis. All this is done upon the same principle, and is based upon the recognition of the same anatomical and physiological facts.

Again, if a man is suffering from acute gonorrhœa, he is likely to have retention of urine from contraction of the muscles or muscular fibre of the urethra, or he may experience a very violent erection. What does all this mean? Merely that the same nerves which supply the lining membrane of the urethra supply the muscular walls of the urethra, as well as that muscular apparatus which, by acting on the venous circulation of the penis

at its root, tends to produce a congested condition, or a fulness of the penis. The irritation in the mucous membrane manifests itself by spasm or contraction of the muscles of the urethra, so as to induce spasmodic stricture and retention of urine, and interferes with the return of blood from the penis, so as to cause distention of the organ or a state of semi-erection. How frequently we see a spasmodic condition of the urethra supervening upon old organic stricture, and causing retention of urine! No doubt it depends upon irritation, beginning with the urethra behind the stricture, which exerts its influence, first upon the nerves of sensation, and thence upon the muscles of the urethra, through the excito-motor function of the spinal marrow. Large doses of opium relax this muscular spasm, and the patient is able to micturate.

We see this condition of the urethra and penis partially displayed in the case of fracture of the spine in the dorsal region, when a portion of the marrow is left uninjured below the fracture. In such cases, by repeatedly pinching the skin of the penis or scrotum, you may produce a spasmodic contraction of the muscles of the urethra and penis, and a fulness of blood in the penis, so as to make it resemble an imperfect erection or priapism. The pudic nerve, which is distributed to the mucous membrane of the urethra, supplies the muscles of the penis, the skin covering them, and the penis itself. It is the friction upon the nerves of the surface of the penis which induces the erection and emissions associated with sexual intercourse, or with masturbation, by exciting associated muscular contraction in the muscles of the penis.

Surgeons are often consulted regarding onanism and its treatment, and it is a very important matter. It is a habit very difficult to contend with in practice. I know of no way to prevent onanism except by freely blistering the penis, in order to make it raw, and so sore that it cannot be touched without pain. This plan of treatment is sure to cure onanism. I have adopted it during more than twenty years. Gentlemen have come to me and said, "I have for many years suffered from this abominable, disgusting habit, and I have tried to cure myself of it, but I cannot; for my morbid inclination overcomes my disgust when awake, and when asleep I think I am sometimes pursuing it. Can you offer any suggestions?" I have said, "Paint this strong solution of iodine over the whole of the skin of the penis every night; and if that does not make the organ too sore for you to touch it, then apply in the same way a strong blistering fluid to the penis." The result in practice of my experience has been that in almost every instance the continuance of the habit has thus been entirely prevented.

Here is a case which bears on this subject. The notes are from the patient's surgeon.

"W. B——, aged fifteen, is one of eight children, all of delicate constitution. After repeated exposure to cold and wet, he called upon his surgeon Sept. 4th, 1860, complaining of pain in the sacrum and left hip and thigh. He was relieved by purgatives and salines. I saw him on Sept. 11th, with both knees flexed, and complaining of great pain in the lower part of the sacrum, with so much tenderness as to be unable to sit down. The left thigh and leg were very tender, and there was excessive tenderness of the surface all down the spine. No local indications of heat in any of these parts; bowels constipated; tongue coated. He was ordered cathartic pills, colchicum, and an aperient mixture, in strong doses; croton oil and tartar emetic liniment to be rubbed along the dorsal and lumbar portion of the spine. Within a week there was great pain along

the cervical portion of the spine, extending to the left arm. Says the motion of the shoulder is very painful; elbow free; left hand closed tightly, and any touch either of the fingers or wrist caused him great pain. Slight pressure anywhere on the spine produced great pain, according to his own statement.

"Sept. 19th.—Left hand firmly closed; both thighs drawn up; knees bent, and cannot be extended; toes of left foot inverted, and whole limb very sensitive. The mouth is closed for a few minutes two or three times a day.

"This went on till Oct. 3rd, when a physician from London saw him. This gentleman, in consultation, thought that he recognized an important pathological state of the brain or spinal marrow, and pointed out with great precision the pathological anatomy which was sure to be found at the expected post-mortem examination. This prospect made the friends of the patient very anxious indeed.

"On October 7th he was no better; head symptoms were now added, and for a minute or two he became unconscious.

"11th.—No better; valerianate of zinc, with compound rhubarb pills, quinine, &c., were continued.

"19th.—Consulted with the physician again; fits and trismus worse. He was ordered to have bichloride of mercury, iodide of potassium, and bark."

30th.—As the patient was getting worse I was requested to see him. I found him sitting in his chair, the left forearm flexed, with the left thumb turned inwards towards the palm of the hand, and the fingers flexed over it; his face flushing very readily. The skin was cool, and there was no thirst. The pulse was not quick, but the heart was very excitable; the tongue clean; the pupils dilated; skin exquisitely sensitive to the touch when attention was directed to that point, but not when the mind was diverted from it. The contraction of the limb and hand was constant, but could be overcome by persevering efforts on my part, giving way very suddenly. The spine was tender the whole of the way down. I requested that he might be denuded. The penis was very sensitive, and the prepuce prolonged; the genital organs were cold, but highly sensitive; the hands were cold and damp. He had insisted on sleeping by himself, and in having a room to himself. The patient watched especially my examination of the genitals, and when I at that moment looked at him seriously, averted his face as if ashamed. I felt convinced that the whole of the symptoms were the result of onanism.

On October 30th I insisted upon his not sleeping alone, so that he might not be able to continue his habit unobserved. I ordered five grains of mercurial ointment to be rubbed once a day into the axilla, so as to divert his mind from the thing I had in view, and I desired that a blistering fluid might be applied to the penis every night. In about three or four days the hands relaxed and opened, the legs remaining contracted; this contraction continued during sleep. The trismus persisted, but with longer periods of muscular relaxation. The blistering was continued, small doses of morphia were given at night, and the ointment used till the 20th of November. The mouth was a little sore, having been made so by the mercury. The ointment was then omitted, but the application to the penis was maintained.

Nov. 23rd.—This is the surgeon's report: The "fits," &c., continued till to-day, and to-day the trismus lasted longer than at any former time. He suddenly opened his mouth, regained the use of his legs, and no re-

lapse occurred. Subsequently a mixture of strychnia was given twice a day.

I afterwards received this letter respecting the case from his surgeon:—

"My dear Sir,—Young B—— is and has been quite well; he is now in London. He was cured by the end of last November" (one month from my visit). "A slight gleet remained for months after; I did nothing for it but cold baths, &c. The application I painted the whole penis well with was the compound tincture of iodine, made stronger by ten or twelve grains of iodine to each ounce. It 'touched him up well,' I can tell you; but I don't think the friends ever had any idea what we considered the cause of his illness."

Here is a case, then, which bears upon what I have said—viz. that the same nerves which supply the skin supply the mucous membrane and the muscular apparatus of the penis—and which shows how a knowledge of anatomy bears upon practice. Not long after I had visited this young patient, a gentleman called upon me. When he came into my room he said, "You have performed a miracle, sir." "A miracle!" I said; "you really take me by surprise. What do you mean?" "Why, you cured young B——; he is quite well, and at school. Dr. —— said he would surely die from fits resulting from some constitutional influences inherited from his father and mother." I assured him that what I had done was no marvel; that I simply acted upon common sense, experience, and physiological deduction. With that assurance and explanation he seemed to be satisfied, and so was I.

LECTURE XII.

Irritation of Mucous Membrane of Urethra and Vagina—Comparative Insensibility of Upper Portion of the Mucous Membrane of the Rectum, Illustrated by Cases of Cancer, Vascular Growth, and Overloaded Colon—Great Sensibility, Difficult Dilatation, and Enduring Power of Contraction, the Characteristics of Lower Portion of Rectum—Ulcers of the Rectum Cured by Mechanical and Physiological Rest—Anatomical Relations of the Nerves, Muscles, and Mucous Membrane of Anus—Arterial Supply of the Rectum—Arterial Association of various Parts of the Body—Enlarged Lymphatic Glands near the Rectum—Sympathetic Pains Produced by Anal Ulceration—Division of Nerves and Muscular Fibre in these Cases—Anal Ulcer Producing Retention of Urine and Symptoms of Pregnancy Cured by Dividing the Sphincter—Anal Ulceration Treated by Division of Sphincter—Intestinal Obstruction Treated by Mechanical and Physiological Rest.

Towards the conclusion of my last lecture, I directed your attention to the physiological relation of the free surface of mucous membranes to the muscular fibres surrounding them, and I intimated that, as regards the urethra, we could recognize that normal association causing, through the medium of the nervous system, certain symptoms, such as spasmodic stricture of the urethra, and of erection during gonorrhœa. In allusion to the same subject, I may now add, that cases of chordee, accompanied by a twisting or bending of the penis, or by a lesser degree of fulness of that organ on one side, may depend upon one side of the urethra being more irritated than the other.

The condition which is met with in gonorrhœa, and known as chordee, owes its origin at different times to different causes. In all of them there is liable to be a twisting or bending of the penis. In one set of cases this occurs very suddenly, and is due to spasm of the muscles which control the blood supply of the organ, this spasm being in its turn caused by irritation of the pudic nerve, which supplies alike the erector penis and the irritated and inflamed mucous membrane. Another such condition, like the first sudden in its onset and temporary in its duration, occurs especially at night, and is due to something very like excito-motor action residing, and at this time aroused, in the cord, now that it is deprived of the control of the brain, the patient having usually just fallen asleep. The above cases are those which are relieved, as previously stated, by opium.

Another condition, though described by the same name, is quite distinct in its origin from the above. It is that twisting or bending of the penis which is brought about by effusion of inflammatory products into the corpus spongiosum; this condition often lasts some time, and may be very obstinate.

We all admit empirically the physiological relation of the mucous and muscular structures when we treat such cases by the sedative influence of opium. I will relate an interesting case as illustrating the contraction of the muscular walls of the vagina caused by exposed nerves upon its surface. In November, 1860, I had occasion to see a lady who had been, and was then, suffering exquisite pain and sensibility of the vaginal sur-

face, and distressing contraction of the surrounding muscular walls. She had been married during twelve years, but had never had complete coitus, and coitus only very rarely, and with extreme suffering. She had been under the professional care of many physicians and surgeons for the relief of her distressing state. A fortnight before my visit to her, a surgeon had given her chloroform to insensibility, and used great mechanical force in order to dilate the vagina. I examined the vagina with care, and found several raised papillæ, or tubercles, exquisitely tender, so tender that she could not bear their being touched. Dr. B. Hicks subsequently examined her, together with myself, and we noticed that merely blowing air upon the parts gave her exquisite pain. Chloroform was administered, and we removed the sensitive tubercles, and brought them to Mr. Quekett for his microscopic examination. Mr. Quekett explained to me that he had found that the papillæ were denuded of the natural amount of epithelium, and that exposure of the nerves running into them was the explanation of the highly sensitive character of the surface of the vaginal mucous membrane. The mucous membrane and the muscles being supplied by the same nerves will explain the extremely contracted condition of the vagina. For some time after this operation the patient was considerably relieved. For the purpose of ascertaining whether she was much relieved permanently, I saw her a short time since, and she admitted that she was somewhat better, but not decidedly cured. This condition of the vagina has been described by the general term of vaginismus, or some such name. The explanation which I have now offered is the only one that I can arrive at based on morbid anatomy. Ovarian irritation and nervous association should not be overlooked while tracing cause and effect in such a case.

I now proceed to the consideration of the mucous membrane of the rectum. First I would allude to its want of sensibility in a healthy state, except at its lowest part near the anal aperture—a very wise provision, accounting for the absence of pain and irritation from the almost dry hardened fæces frequently lying there for a considerable time, and distending the gut. The combination of little sensibility and great distensibility causes no direct warning or prompting by pain to patients except when the distention is extreme, or the mucous membrane inflamed. The anatomist and the surgeon may, I think, make a very decided and practically useful distinction between the upper two-thirds or more, and the lower part of the rectum. The upper part manifests great distensibility and scarcely any sensibility, while the lower portion possesses exquisite sensibility, associated with great muscular force, which resists distention. Diseased conditions of the upper, middle, or lower part of the rectum, except the last inch or two, induced but little pain. Hence cancer, ordinary ulceration, polypus, extraneous bodies, vascular tufts, or other disturbing causes, may exist above the lower two inches without causing pain. I have often seen these observations confirmed by patients, who could scarcely believe it possible that they could have so serious a disease as cancer of the rectum without feeling pain. Some time since a gentleman came to me in great mental distress, looking dreadfully depressed in spirits. He said, "I have been told that I have cancer of the rectum, and am sure to die soon. I do not feel any pain, and I can hardly believe it, for I never heard of cancer without pain." I examined the rectum, and found cancer clearly enough, three or four inches above the anal aperture, and told him so. He was rather angry at me for confirming the opinion of his surgeon. Experience, however, compelled me to force my conclu-

sion upon him, notwithstanding his freedom from pain. I know a gentleman who has had cancer of the rectum five years without pain, and he still pursues his daily occupation. If remote pain or cramp in the lower extremities be associated with cancer in the rectum, it is a bad indication, because it is suggestive of a direct encroachment upon some of the adjoining nerves, either by implication and enlargement of the glands, or by simple extension of the original disease.

I may mention another case illustrative of the slight sensibility of the upper part of the rectum. About fifteen years ago I saw a lady, with Mr. Prance, a surgeon at Hampstead, who had been for some time annoyed by something in the rectum. There was no distinct or painful sensation, only some uneasiness, with occasional loss of blood from the gut. She had noticed a groove or longitudinal depression upon her fæces. We examined the rectum by the aid of a long narrow glass reflecting speculum, and we found, about four inches from the anus, a vascular growth, projecting into the gut from its posterior aspect, which explained both the impression made upon the fæces and the cause of the hæmorrhage. I applied strong nitric acid to this growth in the rectum through the glass speculum. After several applications, we ultimately cured it by sloughing. It was noted at the time that the nitric acid did not produce pain, but only a sense of extreme heat in the intestine.

Puncturing the urinary bladder by the rectum is almost painless, and nitric acid applied to prolapsed gut produces but little pain if neatly done; on the other hand, if the acid be carelessly applied, and runs over the edge of the sphincter, then the patient suffers extremely. Distention of the rectum by fæces does not cause any pain to the patient.

Thus I remember, on one occasion, seeing the wife of a surgeon who had œdema of the left leg. The cause of this had to be discovered. It was produced by a loaded colon and rectum, which explained the whole thing. I occupied two hours on two separate occasions scooping out the fæces, and at length succeeded in emptying the rectum. She could not believe that her colon and rectum could be so overcharged without causing pain or inconvenience, more especially as she had had her bowels slightly relieved every day. I mention these few cases simply to illustrate the practical relation of the little piece of physiological anatomy to which I have alluded. Little sensitiveness and easy dilatability are the physiological characteristics of the rectum, except at the lowest part, where great sensitiveness, little dilatability and enduring power of contraction are the normal physiological features. These natural local peculiarities should be borne in mind both in forming a diagnosis and in considering the principle of treatment to be adopted in any case. The strength and endurance of the anal sphincters are well exemplified by their successful antagonism to the peristaltic action of the colon and rectum upon large quantities of fluid or solid feculent matter, constantly gravitating towards the anal aperture, guarded by the watchful sphincters. Who is there that has not felt this kind of competitive struggle, this intestinal warfare going on within himself, fearing the issue, and has not been thankful for the result, and full of gratitude for the enduring strength of the little indomitable sphincter, which has averted the possible catastrophe?

Simple ulcer in the rectum, extending upwards from one inch above the lower margin of the internal sphincter, may be spoken of as capable of being cured by physiological rest alone. Here is a case in point. A married lady, strong and healthy about thirty-six years of age, had enjoyed remarkably good health up to the summer of 1859, when her

bowels began to be constipated, and she had some pain in passing her motions, followed by a small quantity of blood. In August, 1859, the pain was so severe and constant that she could not sit on a chair without great suffering, the pain being much increased after defecation, and continuing during many hours, although she placed herself in a recumbent position, that being the one which seemed to suit her best. She had decided difficulty in micturition, and pain over the posterior part of the sacrum; her menstruation was healthy. She was advised to take "warm" purgative medicines daily (I suppose the term warm was employed that they might be considered the more inviting), to use fomentations to the anus, and to be careful in her diet. She strictly adhered to this advice until the spring of 1860, suffering more or less the whole time. She had no distinct purulent discharge from the anus, but thought she saw some matter occasionally with the motions; very small quantities of blood were commonly mixed with the fæces. In April, 1860, being then a great sufferer, she applied to a physician in my neighborhood, who examined her rectum, and treated her for piles, without any improvement in her symptoms, until the middle of June, 1860, when, by the physician's advice, she consulted me. I passed my forefinger through the spasmodically constricted or tightened sphincter without giving her much pain, nor did I induce any pain by pressing my finger carefully and with attention over the whole of the inner circle of the sphincter, the ordinary seat of painful ulcer. This freedom from pain induced me to believe that there was no ulcer directly within the pressure of the sphincter. Extending the finger into the rectum, I found I gave the patient some pain by pressing upon the gut towards the sacrum, and on withdrawing my finger there was some blood upon it. I then introduced the small reflecting speculum, cut obliquely at the end, and, on directing it towards the sacral aspect of the rectum, an ulcer was visible, ovoid, but irregular in form, its margin a little thickened, with its long axis placed vertically. It was about an inch and a quarter in length, and three-quarters of an inch in width at its widest part. The lowest part of this ulcer was placed a full inch above the sphincter of the anus. All the painful symptoms before alluded to were still in existence.

I would most urgently press upon your attention that these cases are to be treated by simple mechanical and physiological rest. I therefore requested her to be nearly always lying down, to eat no hard indigestible food, to live chiefly upon good and often-repeated fluid nourishment made from meat, plenty of milk, with some lime water; to take, if necessary, the confection of senna, with bicarbonate of potash, in the middle of the day, in order to soften the motion, and to secure relief from the bowels just before going to bed, she was also directed to use a warm-water enema every night. After the bowels had been freely relieved by these means, one large tablespoonful of decoction of starch, with twenty drops of the sedative solution of opium mixed with it, was to be thrown into the rectum, to remain there. From the first time this injection was used she began to be relieved from her symptoms. All my recommendations were very carefully carried out. At the expiration of a fortnight she came to town again, cheerful and free from anxiety. She was free from pain excepting occasionally, and she told me she thought she was well. I examined the rectum again with the speculum, and saw the ulcer reduced to short and narrow dimensions, and cicatrizing healthily. I persuaded her to continue the same plan of treatment for another fortnight; at the expiration of that time she came to me quite well in every respect. The

introduction of the finger gave no pain, nor was it followed by any blood. This lady continued during several months perfectly well, since which time I have not seen her. This is a case, I think, cured simply by mechanical and physiological rest. It is not too much to say that she was cured in one month, after a year of suffering and unavailing treatment.

To show the relative value of this kind of soothing treatment as compared with that by local irritants, let me mention another case. A gentleman came to me on the 17th of September, 1861. I well recollect the day, because I was cold and shivering from an attack of ague caught in Holland; I was angry, ill-tempered, and felt very uncomfortable. The patient was between sixty and seventy years of age. He told me that he had suffered much pain in his rectum, and that he had been under the conjoined care of two surgeons, who had assured him that he had not any cancer, but they could feel and see an ulcer in his gut, to which they had applied, in the form of injections, solutions of nitrate of silver, sulphate of zinc, sulphate of copper, and some preparation of lead. He added, "I must honestly tell you that although I have taken an immense quantity of medicine, I am a great deal worse than when I went to them." I proposed to examine his rectum. "No," he said, "you must not examine me; I won't be examined any more. I have suffered so much already from that speculum." I said, "You are very foolish; I cannot tell with certainty what is the matter till I have examined you." But he would not permit any examination, and I was very angry with him. I advised him to get his bowels well emptied every night, just before going to bed, by large common gruel or warm-water injections; after that to inject twenty drops of sedative solution of opium mixed with a solution of starch. I finished by saying, "Let me see you two or three weeks hence." "What," said he, "no pills?" "No." "No medicine?" "No." "What, nothing at all?" "Yes," I said; "do not neglect your diet, take care that the fæces shall be soft and small, and not hard or massive." "What, nothing but that?" "No, nothing." He and his son then went away, and, feeling ill, I was very glad when they were gone. I scarcely expected to see this patient again, but towards the end of October, that is, in about six weeks, he called again, to inform me that he had felt quite comfortable ever since his former visit, by only doing what I had told him. Now here was a case in



FIG. 51.—*a*, Sacrum. *b*, Coccyx. *c*, Tuberosity of ischium. *d*, Posterior or larger sacro-sciatic ligament. *e*, Anterior or small sacro-sciatic ligament, with the pudic nerve passing over its posterior aspect, and proceeding to the rectum and penis. *f*, Sphincter ani receiving its nervous supply from the pudic nerve. Portions of the muscle have been cut away, in order to show nerve filaments going to the mucous membrane, through the muscular fibres. *g*. Levator ani. *h*, Fat and areolar tissue occupying the ischio-rectal fossa and covering the levator ani. *i*, Transverse muscles of perinæum. *k*, Erector penis. *l*, Accelerator urinæ. 1, Pudic nerve. 2, Posterior sacral nerves proceeding to posterior part of the coccyx and to the sphincter ani. 3, Anterior sacral nerve (4th) supplying the sphincter ani.

point. This man's rectum had been painful for nearly three months; besides the almost constant use of purgative medicines, two or three times a week he was examined by a speculum, and had injections of nitrate of silver, or sulphate of zinc or copper, and all that sort of thing, adding, as I believe, to the local irritation, until his condition was hardly endurable. By the simple means that I have mentioned he was at once improved. So far as I know, he was cured by the method of physiological rest, as opposed to violence or physiological disturbance. I merely mention these facts as suggestive of the adoption of a plan of treatment by rest and quiet in preference to one of irritation. I am further able to state that this patient remained free from any subsequent trouble with regard to his rectum up to the time of his death, which took place in 1874.

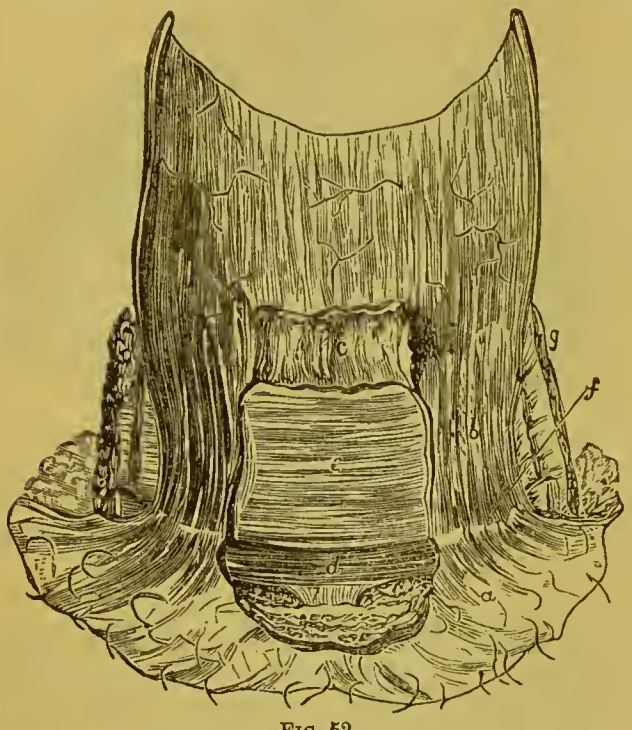


FIG. 52.

I would now solicit your attention to the anatomy of the immediate neighborhood of the anal aperture. I would refer to it only in regard to the muscles, blood-vessels, lymphaties, and nerves of the parts.

This drawing or diagram (Fig. 51) represents the anal aperture, with its associated muscles and nerves, including sacral and pudic branches; some of the latter are shown as perforating the muscular fibres to reach the subjacent mucous membrane.

Here is another drawing (Fig. 52), which to my mind is of great interest, because it exhibits one of the important landmarks capable of guiding the surgeon in his operations. If you ask a surgeon, "Where are you going to cut to divide the sphincter of the rectum? Have you any lines to direct you?" "No, none at all." But I think this will answer the purpose. Fig. 52 represents the lowest part of the rectum laid open, and its walls partly exposed by dissection (*c*); a white line (*f*), which in the living subject any surgeon can recognize, shows the junction of the skin (*a*) and the mucous membrane (*b*). That white line corresponds exactly with the linear interval between the external (*d*) and internal sphincter muscle (*e*). It is an important landmark, exact and truthful, so that it can be relied upon. The circular fibres displayed above the line form the lower portions of the internal sphincter fibres, which gradually become more attenuated as you trace them upwards within the walls of the gut. The levator ani (*g*) is seen in section on each side, in a position external to the sphincter muscle.

The special object of this drawing is to show the precise line of junction or demarcation of the internal and external sphincter of the anus, and that line exactly corresponds (I have tried it several times) with the white line of junction between the skin and the internal mucous membrane. I

had long ago traced the nerves through the walls of the gut; from whence some went to be distributed downwards upon the skin close to the anus, and others reflected upwards to the mucous membrane. I was familiar with that anatomical arrangement, but I was not acquainted with what

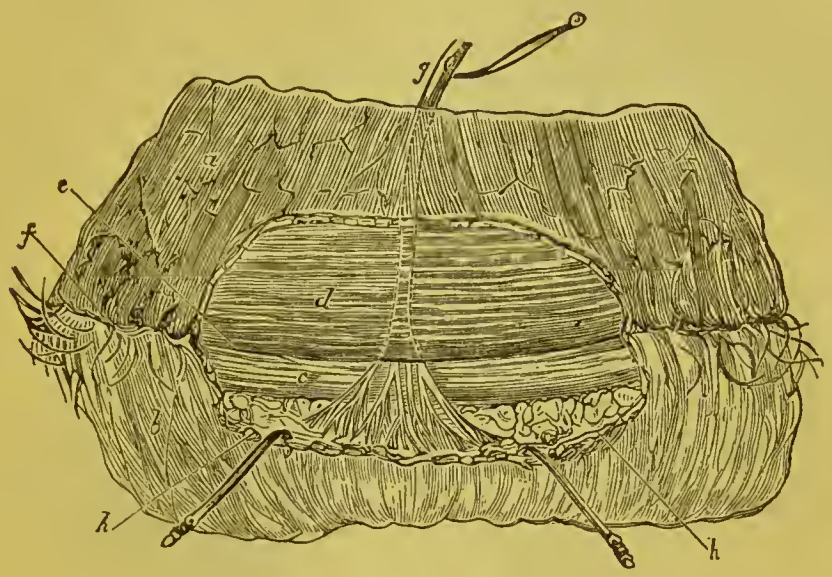


FIG 53.

FIG. 53.—This drawing from nature represents a portion of the rectum and adjoining skin laid open. *a*, Mucous membrane of rectum. *b*, Skin near the anus. *c*, External sphincter muscle. *d*, Internal sphincter muscle. *e*, Line of separation of the two sphincters. *f*, The overlying white line marking the junction of the skin and mucous membrane. *g*, Nerve supplying the skin and mucous membrane near the anal aperture, which it reaches by passing first externally to the rectum, and then goes through the interval between the two sphincters, and thence is distributed upon the mucous membrane and the skin. *h h*, Mucous membranes and skin dissected downward and fixed with hooks, so as to stretch the nerve filaments supplying these parts.

Fig. 53 so clearly displays, viz. that filaments of nerves (and they are very numerous), derived from the pudic, and possibly from other nerves, pass through the gut exactly between the internal and external sphincter, therefore exactly underneath that white line of union of mucous membrane and skin, and thence some proceed upwards towards the lower part of the mucous membrane of the rectum covering the internal sphincter, and others proceed to the skin near the anus.

In order to complete the nerve anatomy of this part, which requires to be well considered for the purpose of explaining the varied nervous symptoms which may be induced by an ulcer within the rectum and near the anus, I have made (Fig. 54) a rough map of these parts, with an ulcer depicted upon the surface of the sphincter. Two lines indicating two nerves are seen directly communicating with the ulcer, and the arrows point to the fact that the sensitive nerve conveys its influence from the surface of the ulcer to the spinal marrow, and that the other, or motor branch of the same nerve, conveys motor power from the spinal marrow to the sphincter muscle; thus explaining how the excitation or irritation engendered at the ulcer may be conveyed to the spinal marrow, and produce reflected effects upon the sphincter muscle, leading to painful contraction. I would further notice that this "sign-post" map tells us that the pudic nerve, which supplies the portion of the anus upon which the ulcer is placed, is intimately associated with other nerves arising from the lower part of the spinal marrow. It also shows that some of those associated nerves go to the lumbar region, some over the hips, some down

the leg, and others to the urinary bladder and urethra. It is an indisputable fact that these anal ulcers cause lumbar pains, iliac pains, pains and loss of sensation, or cramps, in the leg, and irritation about the bladder and urethra. These symptoms cannot be explained, except under the title of "anomalies," unless you choose to refer to the nerve anatomy of the part, when the explanation is made easy and sufficient.

Mr. Quain has shown that the upper part of the rectum receives a comparatively small quantity of arterial blood, while the lower part of it is very freely supplied, and this forms an important difference. I hope I may here be indulged with a short digression, with the view of alluding to the great precision which marks the supply of arterial blood to some

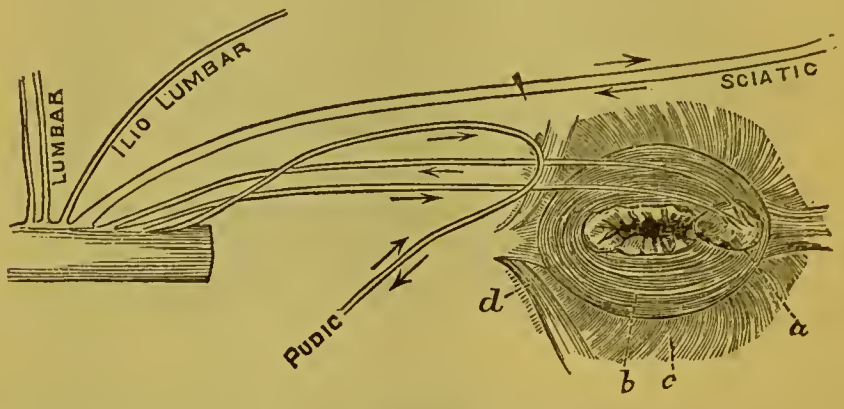


Fig 54.

Fig. 54.—*a*. Ulcer on sphincter ani (*b*). Filaments of two nerves are exposed on the ulcer, the one a nerve of sensation, the other of motion, both attached to the spinal marrow, thus constituting an excito-motory apparatus. *c*, Levator ani. *d*, Transversus perinæi.

parts of the body. I might put the subject before you in this manner, and ask, Why should not the whole of the rectum be supplied with blood from the inferior mesenteric artery? At first thought there appears to be no reason why that artery should not carry the blood downwards to all the lower part of the rectum as well as to the upper. Yet it is not so; the lower part receives its arterial supply almost exclusively from the pudic artery. A very few branches may be traced from the inferior mesenteric and middle sacral to join the pudic, but the chief supply is derived from the pudic arteries, which thus bring the neck of the bladder, the perineum and the urethra into intimate *structural association* with the rectum. As I think this kind of definite distribution of arteries is a point not sufficiently dwelt upon, allow me to remind you of a few illustrative instances observed in the human body. Take, for instance, the cœliac artery, which is distributed to the organs of digestion, and nothing else: it supplies the liver, stomach, pancreas, spleen, and part of the duodenum—that is all that it does. As these are all organs connected with the process of digestion, the cœliac artery might well be called the "digestive artery." Take another illustration: the os hyoides, placed between the larynx and the pharynx, is functionally and structurally associated with both. Does not anatomy tell us that the os hyoides receives a hyoidal branch from the superior laryngeal artery, and a hyoidal branch from the lingual artery on each side? Is not the os hyoides connected with the functional and structural integrity of both the larynx and the tongue, intimating the reason of the double source of arterial blood for its growth and nutrition? There is a disposition on the part of anatomists to think and to teach that nerves are distributed with designed accuracy, but that there is very little

design in the distribution of the arteries. I opened this subject many years ago, when endeavoring to explain to the students of Guy's Hospital the purpose of the division of the subclavian artery into its numerous branches. I pointed out that the branches distributed from the subclavian trunk, apart from its continuation to the upper extremity, are distributed with one simple purpose, viz. to supply all the parts concerned directly and indirectly in the process of respiration—that is the simple object of the distribution of the subclavian artery. Thus:—

The vertebral, besides supplying other parts, is distributed to that portion of the spinal marrow from which the phrenic, spinal accessory, and posterior thoracic—all important nerves of respiration—take origin.

The internal mammary supplies the sternum, cartilages of the ribs, origin of the pectoralis major, phrenic nerve, diaphragm, and the upper half, or the respiratory portion, of the abdominal muscles.

The superior intercostal artery goes to the first and second ribs. Now, the first is the most important of all the other ribs in the respiratory function, as it forms the fixed point for the action of the intercostal muscles in elevating the chest.

Of the branches of the thyroid axis, the inferior thyroid builds up the trachea, a tube essentially connected with respiration, and sends a branch upwards (ascending cervical) which accompanies and nourishes the phrenic nerve and constitutes, in fact, an ascending comes nervi phrenici. The transverse cervical supplies the trapezius and the posterior border of the scapula, with the muscles attached to it, all of which may be considered accessory to respiration. The supra-scapular supplies the clavicle and scapula, both of which are rendered respiratory by the attachment they give to accessory respiratory muscles.

Look at the arterial distribution of blood to the soft palate derived from several different sources. The soft palate is functionally connected with respiration, deglutition, and mastication, so we ought to discover that its arteries are derived from the trunks of those arteries which supply the face and lips, those which supply the masticatory apparatus, and the walls of the pharynx. Curiously enough, this soft palate receives six arteries, three on each side: one from the facial, the ascending palatine, which seems to take a wandering, devious course up to the soft palate; one from the ascending pharyngeal artery; and one from the internal maxillary, the true "masticatory artery:"* each of these trunks sends a palatine

* Mr. Hilton, in his Lectures on the Cranium, speaks thus of the course of one or two branches of the internal maxillary artery which at first sight seems to have nothing to do with mastication; and first of the course of the middle meningeal to the interior of the skull: "If it were only for the sake of a supply of a certain quantity of blood to the dura mater, the special intra-cranial arteries, viz. the two internal carotids and the two vertebrals, would be amply sufficient for this purpose, and there would be no necessity for the entrance of those streams that are derived from vessels supplying parts on the exterior of the skull. There must, therefore, be some design in such an arrangement. The essential purpose of the internal maxillary artery is to build up or nourish those parts directly necessary or accessory to the process of mastication, so that it may be fairly called the masticatory artery. From this trunk is derived the middle meningeal artery, which, whilst ramifying in the dura mater, gives branches outwards, that supply the squamous portion of the temporal, the greater wing of the sphenoid, the frontal, and the parietal bones; those bones, in fact, which contribute to form the temporal fossa, the chief origin of the temporal muscle, one of the most important agents of mastication. It also gives a branch inwards to develop and maintain that other portion of the great wing of the sphenoid which gives origin to the external pterygoid—another important muscle of mastication. The middle meningeal artery, therefore, may be said to be sent by the internal maxillary into the

branch to the soft palate. Here, then, is a simple piece of anatomy, which shows the precision and purpose of the distribution of arteries which seem to be associated with three different important functions: one in relation to respiration, associated with the muscles of the mouth derived from the facial artery; another in relation to deglutition, receiving its supply from the ascending pharyngeal artery; and a third in relation to mastication, receiving its supply from the masticatory artery. This digression opens an interesting topic as an appendage to the reason why the lower part of the rectum should be supplied with blood from the pudic, and not from the inferior mesenteric artery.

The lymphatics of the rectum enter their glands placed within the pelvis, and sometimes lead to the inflammatory enlargement of those glands. They can then be felt through the rectum within the pelvis, forming nodulated masses suggestive of malignant disease, and thus become sources of great anxiety. I remember seeing, with the late Mr. Aston Key, a private patient in whose case (chronic ulceration within the rectum) the greatest alarm had been expressed by another surgeon, because several hard nodular masses could be detected within the pelvis, encroaching upon the rectum, and leading him to think that the patient was suffering from cancer. It turned out to be nothing more than swollen lymphatic glands in a state of enlargement or irritation, in consequence of their having received morbid fluid from the ulcer; and, as soon as the ulcer was cured, the glands subsided, and there was an end to the difficulty. In that patient I repeatedly felt the enlarged glands, about three inches within the rectum. This association of enlarged glands with ulcer within the rectum is a point that should be borne in mind, but is generally overlooked.

The pathological relation of the ulcer to the various nerves already referred to is very clearly evidenced by noticing that the suffering of the patient, from his remote sensations and pains associated with those nerves, is relieved as soon as the ulcer is divided. From that time all those pains cease. It amounts pretty nearly to a demonstration that the ulcer was the cause of all the remote sympathetic pains propagated or induced by nervous continuity from the site of the ulceration. Physiology, anatomy, experience, and practice indicate that a patient may have pains over the loins and hips, pains down the legs with loss of sensation, pain and contraction of muscular fibre connected with the urinary and generative organs, all produced by an ulcer upon the internal part of the sphincter, so largely is this supplied with nerves which endow it with exquisite sensibility.

Let us now apply this local anatomy to explain the pathological symptoms manifested at the seat of the disease, as well as those remote (or so-termed anomalous) symptoms of pain, cramps, slight numbness, and slight

interior of the cranium to build up, and afterwards to nourish, that portion of its extent, which, in giving attachment to masticatory muscles, is rendered subservient to the masticatory function. So fully, indeed, is this intention carried out, that a small artery given off from the middle meningeal, or the trunk of the internal maxillary itself, enters the cranium by the foramen ovale, apparently for the express purpose of furnishing nutritive material to the third division of the fifth—the nerve that supplies the muscles of mastication. Now, although the intra-cranial portion of the third division of the fifth is situated in such close proximity to the entrance of the internal carotid artery into the skull, yet it is not supplied by this vessel, but, as we observe, receives a distinct offset from the masticatory trunk, so that its nutrition may be maintained in the closest possible relations with that of the other structures administering to the same function."—[Ed.]

loss of muscular power in the lower extremity, generally on the left side, or difficulty in making water, with frequent desire, retention of urine, dilatation of the bladder, with pressure upon the rectum, &c. &c. All these symptoms can be produced by an ulcer within the rectum. The characteristics of the ulcer within the circle of the external sphincter are, more or less pain when passing a motion, and severe and enduring pain for some considerable time afterwards. The severity of the pain is explained by the exposure of sensitive nerves in the ulcer, and the persistence is explained by the abundant supply of motor filaments which endow the sphincter muscle with the power to press, rub, and perseveringly squeeze the opposite parts of the ulcerated and sensitive surfaces upon each other. Reflecting on the large amount of nerves which proceed to the sphincter muscle, one understands how it happens that it is so enduring in its power. No doubt the strength of a muscle will in a great measure depend upon its extent or size; but the endurance of active power depends upon the number of nerves supplying the muscle: hence the great endurance of this sphincter muscle, and I know of none that can compare with it in that respect. The principle of treatment of all the various forms of fissure or ulcer near the sphincter is very simple, and usually effective. It is based, or ought to be, on giving the part physiological and mechanical rest. To apply this to practice, the motions should be kept soft and pulpy, so that the sphincter may not be too widely opened during defecation, nor the ulcer exposed to the friction of a large or hard motion. This is obvious common sense; the recumbent position should be observed, which is rest to the capillaries and veins—also common sense. If the case be a simple crack or fissure in the skin or mucous membrane, and we apply nitrate of silver or a solution of bichloride of mercury to it, what do we do? We form an adherent albuminous defence to the subjacent raw surface, in order to give it "rest," and Nature time and opportunity to fill up the gap by repairing the loss of substance. The explanation ordinarily given of the beneficial influence of these albumen-coagulating agents is, that they "set up a new action," as if the agents took an active part in the reparative or reproducing process. On the other hand, I believe their usefulness depends chiefly on their giving "rest" to the parts, and so enabling Nature to fill up the gap. And if this be true, one can see how it is that the rude application of nitrate of silver may do harm, whilst the well-considered and gentle use of it may do a large amount of good in many cases. If a patient has a crack or fissure in the margin of the anus within the area of these numerous nerves, it is exquisitely sensitive, so that if the end of a probe is pressed upon it, the patient sometimes calls out with pain; but directly you cover that surface with the nitrate of silver, the patient is free from pain. Now, what has led to the difference? Simply that these filaments of nerves are not then exposed, but are covered by coagulated albumen. Thus the parts are defended from the external air and all morbid secretions, and in twenty-four hours, perhaps, that

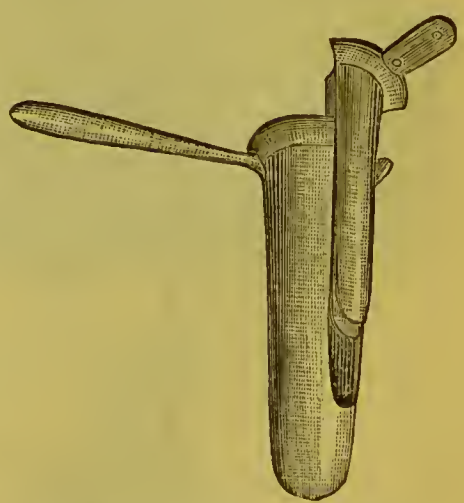


Fig 55.—Rectal Speculum, as used in Guy's Hospital, and bearing Mr. Hilton's name.

crack or fissure is healed, not by the nitrate of silver, not by the surgeon, but by Nature herself. But if you rudely apply the nitrate of silver, you do it without a guiding principle, and will have to do it over again, and that is not a scientific use of it. I often employ, as a local application in such cases, a lotion composed of two grains of bichloride of mercury, ten drops of nitric acid, and one ounce of water; this fulfils the object just as well as nitrate of silver, since it is applied simply for the purpose of coagulating the albumen upon the ulceration, which acts as a mechanical defence to the surface of the ulcer.

If the ulceration, whether oval or circular, be limited to the mucous membrane, and very sensitive from exposure of nerve upon its surface, it may sometimes be treated successfully by the application of opium ointment, or by starch and opium injections at night, or night and morning, the bowels being previously opened by a warm-water or a thin gruel enema. For the purpose of ascertaining the sensitive point of the ulcer (for every part is not so), it should be exposed to view by the aid of the anal speculum. The blunt end of a probe should then be applied to the surface of the ulceration, so as to enable the surgeon to detect the precise point of exposed nerve, by inducing sharp pain. Keep your eye upon that spot, and there apply a very small drop of strong nitric acid; the patient will be almost immediately free from pain. In that way you may successfully treat a sensitive ulcer at the verge of the anus, as you may best treat an irritable and painful one upon the leg; that is, by destroying the exposed nerve in the ulcer. Dividing the mucous membrane by a bistoury is recommended by some surgeons to cure these anal ulcers. How drawing your knife across the mucous membrane of an ulcer is to cure it is unintelligible to myself, except I add that by so doing you divide the nerves and destroy the exquisite sensitiveness of the ulcer; but the rationale of cure by a simple division of the mucous membrane, without reference to the nerve, is to me utterly unintelligible. I do not desire to speak presumptuously in the presence of so much professional experience, but I feel confident that the simple division of the mucous membrane, without the nerve as well, can do nothing curative for an ulcer of that kind. On the other hand, when you succeed in dividing the exposed nervous filaments, by drawing a bistoury across the ulcer, you in that way separate the ulcer from the trunk of the

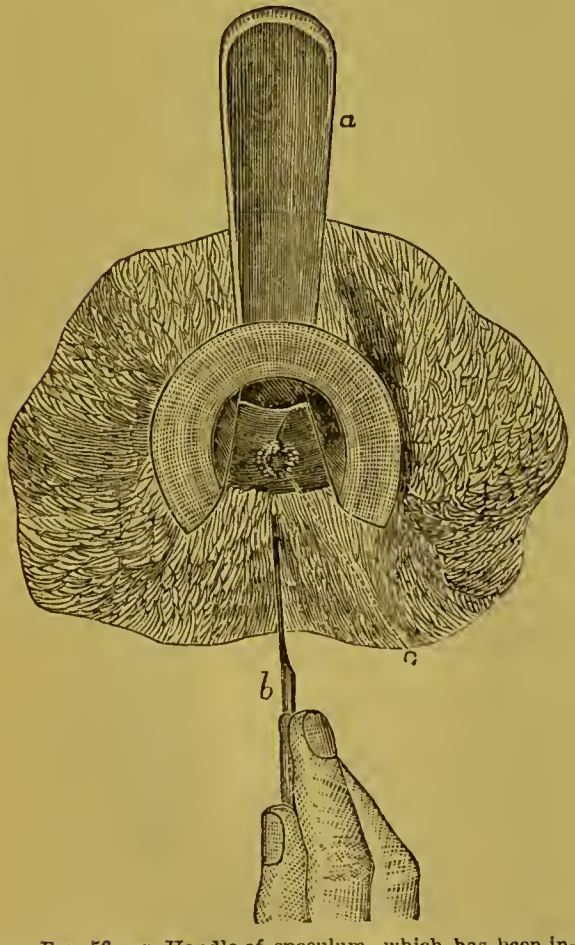


FIG. 56.—*a*, Handle of speculum, which has been introduced into the rectum. *b*, Bistoury passed through the base of the ulcer, so as to divide (*c*), Circular fibres of sphincter.

nerve, and so give it "physiological rest" by relieving the pain. I must state, however, that in the majority of the anal ulcers which I have examined by the aid of the speculum, the circular fibres of the sphincter muscle may be seen to form the base of the ulcer, and in such instances its edges are especially sensitive. I would have it understood that I do not speak with any degree of hesitation in this matter, because I have over and over again, by means of the speculum, seen the circular muscular fibres forming the base of the ulcer. I have observed them with as much precision as I see them in the diagram before you (Fig. 56), so that I have not the slightest doubt upon the point. I may add, that if you touch the muscular part itself with a probe, it is not sensitive; but touch the margin of the ulcer in the same way, and the patient complains bitterly. It is that kind of ulcer in which the circular muscular fibres are actually seen, which is so successfully treated by dividing the sphincter muscle.

The reason for this anal ulcer being so very painful is the number of nerves associated with it; and the cause of the continued painful contraction which accompanies it lies in the enduring strength of the sphincter muscle. Thus it happens that exposure of those nervous sensory filaments upon the ulcer causes excito-motory or involuntary and spasmodic contraction of the sphincter, through the medium of the spinal marrow. The sphincter muscle contracts towards its own centre, and, as long as the muscle is in a state of contraction, it brings the sensitive edges of the ulcer into forced contact; this excites more muscular contraction, and thus, by time and exercise, the muscle becomes hypertrophied, massive, and increased in dimensions. It is worthy of notice that when the muscle has been divided in such cases, it soon returns to its more natural condition, by the muscular fibres resuming their natural dimensions. When we divide the sphincter muscle forming the base of the ulcer, what do we accomplish by this? We cause the two portions of the muscle to contract to their then more fixed points; that is, away from the ulcer. Therein lies the rationale of the operation so frequently performed—it prevents the muscle irritating or annoying the surface or edges of the ulcer by pressing them upon each other during its contractions. Hence I maintain that the sphincter ought to be divided through the centre of the ulcer, and then, as a rule, the operation is permanently successful. The treatment of such cases is really absolutely based upon bringing about local physiological rest, for by dividing the muscular fibre you merely prevent further friction by the contraction of the muscle, and, after a time, Nature repairs the ulceration by filling up the gap which the surgeon has made.

I will now direct your attention to two or three cases illustrative of the anatomical and physiological facts to which I have alluded.

Case of Anal Ulcer, producing Retention of Urine and Symptoms of Pregnancy, cured by dividing the Sphincter Muscle.

The first is the case of a young lady, aged about twenty-two, whom I saw some years ago with the late Dr. Golding Bird. She was an excellent dancer, good company in a drawing-room, and thought to be a very agreeable and attractive person. Gradually she receded from that position in society, lying down a good deal on the sofa, suffering much pain, always uncomfortable, occasionally quitting the room, whether in society or at home amongst her own relations. It was noticed that she had occa-

sional sickness, menstruation was not regular, the abdomen was decidedly increasing in size. She became very fond of lying in bed instead of going to balls and dances—in fact, she said she could not dance or enjoy society at all—and was very uncomfortable. A surgeon was consulted, who, perceiving the patient's changed character, and finding the lower part of the abdomen decidedly large and prominent, mentioned a suspicion of pregnancy to her mother. Her mother, who was personally acquainted with the late Dr. Golding Bird, took her to him. He examined her carefully, and said, "She is not in the family way, depend upon it; I think the symptoms arise from piles, or something wrong in the rectum." It was under these circumstances that I was requested to examine her. I found her suffering from piles and prolapsed rectum, retention of urine nearly complete, enlarged abdomen, sickness, loss of appetite, always in pain at the lower part of the stomach, bowels constipated, frequent loss of blood from the rectum, and extreme pain during and after defecation. Her illness commenced, many weeks before I saw her, with great pain in passing a motion, and all her urgent symptoms resulted from the original anal ulcer. This was the order of events:—The nerves of the anus and neck of bladder being derived from the same trunk-nerve—the pudic—the nerve irritation extended from the anal ulcer to the muscles of the neck of the bladder and urethra. This caused them to contract, and produced difficulty in making water, and subsequently the retention of urine. The protracted distention of the bladder caused pressure upon the rectum, interfering with the return of blood from near the anus, and this, added to the straining of the patient to relieve herself, caused distention of the rectal veins and partial prolapse of the rectum. Hence arose all the other symptoms to which I have adverted.

I passed a probe between the projecting folds of the rectum, and soon made out where the ulceration existed. I removed a portion of an external pile, and then obtained a clear view of it, situated just within the anus, full half an inch wide, and more than three-quarters of an inch in length; muscular fibre formed its base. I divided the sphincter muscle through the centre of the ulcerations, and nearly the whole of the painful symptoms quickly subsided, and the patient was soon well, and as happy and gay as ever. I have seen the lady several times since, and she has remained perfectly well.

Case of Anal Ulcer accompanied by Pain along the Sciatic Nerve, Pain over Left Hip and Loin, Pain in the Right Leg. Case of Arterial Hæmorrhage from an Anal Ulcer cured by Division of the Ulcer.

A surgeon who had pain down the left leg on one side was not relieved until the operation of dividing the sphincter was performed. Time will not allow me to dwell upon this case. I saw a case some time since with Mr. Aiken, of Clifton Place, Sussex Square. The patient had pains over the left hip and loins; he had no treatment except opium with diacetate of lead locally, and this without any benefit. The speculum exposed an ulcer about three-quarters of an inch long and a quarter of an inch wide, commencing just within the internal sphincter, and running directly downwards; transverse muscular fibres formed a part of its floor, the other part was covered with granulations. The pointed bistoury passed through the internal and external sphincter, and, dividing the ulcer into two portions, gave him immediate and permanent relief; he had no pain, even

the first time his bowels were open, after the operation. He was kept recumbent during five or six days, and then began to move about without any inconvenience. Mr. Aiken saw this gentleman the day he sailed for New Zealand, a month after the operation; he was then perfectly free from pain.

The next case is that of a young woman who had an ulcer at the anterior part of the rectum; she had pain in one of her legs—the right leg. The ulcer was at the anterior part of the anus, close to the vagina, and it was necessary to be very cautious in dividing the muscular fibres. A very small knife was passed through the circular sphincter fibres of the anus, and the patient got quickly well.

In 1853 I saw a lady aged forty-two; formerly she had had piles which bled occasionally. For a year and a half before I saw her she had suffered severe pain during and after defecation, accompanied by considerable arterial hæmorrhage from the rectum, which had of late increased immensely. She was thought to be the subject of malignant disease in the intestines, stomach, or liver. A large quantity of blood was passed with the fæces. The motions were white; she was in a state of advanced anæmia. There was no bile in the motions, because she had little or no blood in her liver, and therefore no bile. As the patient had white motions, she had been treated by nitric acid and various alkalies, and afterwards by blue pill and mercurial ointment, to cure the supposed morbid condition of the liver; but the liver had no opportunity of doing its normal work, for it had no blood to do it with. I introduced the speculum into the rectum, and saw an ulcer towards the back part of the anus, on the patient's left side, and an open, bleeding artery near the centre of it, upon its floor. The sphincter was divided, and with it the artery which was bleeding; both were divided at the same time. From that period the patient began to get well, and has been so ever since; she felt no further pain, there was no more bleeding, and her general health rapidly improved.

I must now relate, though from lack of time very imperfectly, another case of interest. It is one of intestinal obstruction, where mechanical and physiological rest did a great deal of good. The patient was a surgeon of great intellect. When I saw him, with Dr. Jeaffreson and Mr. Hancock, he had had insuperable constipation for thirty-one days. There was great vomiting. We agreed that the obstruction must be somewhere in the neighborhood of the lower part of the colon, or the upper part of the rectum. We could not detect it with the finger. We thought that without relief he would die before the morning, and I operated on the same evening. After opening the bowel in the loin an enormous quantity of feculent matter at once escaped, and continued to do so for a considerable period, to the great relief of the patient. I had requested that he would not allow it to close up; however, he improved so much that he thought he might do so. The peculiarity of the case was this: that on the fourth day after the operation, from the relief of the distended condition of the colon, he passed motions by the natural anus, and continued to do so for some weeks, until a gradual accumulation took place, and then a recurrence of the symptoms. I then operated upon him again; the same kind of relief was afforded; and, as the bowels continued to be opened through the anal aperture, he went back to his work, and saw thirty or forty patients a day. Later on he had symptoms of pain in the hip-joint, and ultimately disease of it, from which he died more than twelve months after the first making of an artificial anus. After the first operation he

used to complain of great pain in the lower angle of the wound; when I operated the second time, I put the bistoury lower down, to divide the nerve which had given him so much pain, and from that time he was comparatively comfortable.

Upon making a post-mortem examination, it was found that there was no cancer. There had been a contraction of the intestine where the sigmoid flexure of the colon joins the rectum. This had produced an obstruction, and consequently a distention and overloading, of the colon. The weight of the fæces had caused the colon to descend considerably below its normal position, like an inverted syphon; the fæces, therefore, had to ascend, and then could not pass over the fixed point where the constriction had taken place, the weight of the colon making this part an acute angle, and so producing insuperable constipation. When the opening was made into the upper portion of the colon, the weight of fæces was taken off; the accumulation in the lower part was then forced upwards, and made to pass through the rectum.

LECTURE XIII.

Many Diseases of Joints Attributed to Scrofula the Result of Accident—Case of Disease of the Knee- and Hip-joints on the same Side—Knee Amputated—Pyæmic Joint-Inflammations after Fevers—Hip-joint Cured by Rest—Diseased Joints Require a Long Time for Cure—Joints Protected from Injury or Over-exertion generally Free from Disease—The Costo-Vertebral Articulations an Example of this—Pelvic Articulations—Diseased Joints more Frequent in the Lower than the Upper Extremities—Disease of Outer Side of Foot more Frequent than Inner—Healthy Joints not Likely to Deteriorate from Rest—Foot of a Chinese Lady—Diseases of Joints Modified by Age—Grating Sensation in a Joint before Cure by Anchylosis—Peculiar Course Followed by Diseases of the Joints in Children.

In my seventh lecture, after referring to the fact that the same trunks of nerves supply the joints and the muscles and skin over them, I stated that one of the normal results to be obtained by this distribution of nerves was to insure mechanical and physiological consent between the external muscular, or moving, forces and the vital endurance of the parts moved, chiefly in the interior of the joint, during friction or pressure; thus securing in health a true balance of force and friction. If this point of balance or adjustment be overreached by accidental violence or undue exertion, then pain, Nature's warning prompter, is induced within the joint, and suggests the necessity of diminishing or arresting exertion. Without this muscular and articular nervous association in joints, there could be no intimation of the exhausted function of the internal parts. When this functional exhaustion of the internal parts has been reached, and articular pressure with friction is nevertheless continued, then mischief to the articular structures, whether in the soft parts or in the bones, commences, and what we term disease of the joints starts into existence. In this statement are the elements of my opinion and belief, that diseases of the joints in children are the results of accident or over-work, and that they are not simply selected by Nature for the development of the constitutional or scrofulous diathesis. Yet I do not think I wrongly express the prevailing opinion of the profession, or, at any rate, of many surgeons, when I say that there exists in their minds an inclination to believe that diseases of the joints in young persons are most frequently to be regarded as the manifestation of a constitutional tendency, spontaneously expressing itself as scrofulous, and starting without local injury. Indeed, by some surgeons, it is thought that such diseases of the joints may be deemed, as it were, the local emunctory of a scrofulous or cachectic constitution, and that such cases, therefore, are not curable except through the constitution or general health. Further, that if the local disease of the joints be cured, the same kind of disease will show itself elsewhere, perhaps in some part of the body more important to life. Now, this would be almost to argue the impropriety of curing the disease of the joint at all. I must state my own conviction, that in comparatively few cases is the interpretation sound and good. I base this opinion on the aggregate cases of joint diseases which are brought before the notice of

the surgeon both in private and hospital practice; indeed, I believe that the diseases of joints are almost invariably the results of local injury, and that if they were recognised early, and treated by appropriate rest, nearly all of them would get well. This, then, is to contravene the generally received notion that so many cases of joint disease are the result of scrofula. I will admit that the untoward consequences or results of such cases, originating, as they do, in slight local injury or over-exertion, are in some measure owing to the unhealthy constitution of the patient, and that the same amount of injury in persons perfectly healthy would, in all probability, have caused no such prolonged condition of disease. But then it should be remembered that if the general health be bad, it is equivalent to the confession that the powers of reparation are feeble, and that, therefore, rest, or freedom from local disturbance, becomes in such cases the more necessary. Unless a due and proportionate amount of rest has been maintained from the beginning, they do not offer a fair comparison with cases in which the constitution is absolutely healthy.

Case of Disease of the Knee- and Hip-Joints on the same side.

To give this subject a practical bearing, I may just introduce a few short notes of a case which came under my notice some years ago. It shows the advantage of removing, in certain rare cases, a "scrofulous" joint, as it is termed, and also demonstrates the value of rest in the treatment of disease of the hip-joint in a "scrofulous" patient.

On the last day of December, 1849, I saw near Ipswich, with Mr. Bartlett and Mr. Bullen, surgeons of that town, a young gentleman, of unmistakably strumous diathesis, suffering from severe disease of the left knee-joint, originally the result of an injury. This diseased knee was destroying his general health by pain, sleepless nights, loss of appetite, and other depressing symptoms, in addition to a very profuse discharge from sinuses communicating with the interior of the joint. His constitutional condition was very bad; he had at the same time—and this is the remarkable point in the case—serious disease of the hip-joint on the same side, with some local indications of abscess associated with it in the upper part of the left thigh. The question for our consultation was, whether the removal of the knee-joint was justifiable and to be recommended, bearing in mind his scrofulous constitution, and the existence of hip disease. We argued in this manner, that considering, in addition to the other symptoms, the quantity of purulent discharge constantly escaping from the knee, which might be regarded as, in some respects, not quite equivalent, but as representing or analogous, to small and frequent venesections, we might expect, if we could free his system from these sources of vital exhaustion, by the amputation of the limb above the knee-joint, there would, in all probability, be a great improvement in his general health. The knee-joint was very much flexed, and it would have been useless at that period to put it straight. We also argued that the freedom from disturbance, which the removal of the knee would secure for the diseased hip-joint, might be a great advantage in reference to the repair of that joint. For by giving him a shorter lower extremity, and by making his limb less weighty for his enfeebled muscles to support, we might succeed in our expectation of insuring rest to the hip-joint. On these grounds especially, there being no distinct phthisis, we decided that amputation of the leg should take place, and it was well done by Mr. Bartlett, with the loss of but very little blood. The removal of the knee-

joint allowed the appetite and general health to be quickly restored, and the patient was in a very short time off his bed, and out of doors; still suffering from the disease in his hip, but yet going about on crutches, with a very short femur, and therefore very little weight of limb. His muscles, although feeble, were yet sufficiently strong to support, without any difficulty, the shortened femur, and to sustain its head in easy contact with the acetabulum.

Here I may remind you that it is impossible to obain anchylosis between two articular surfaces in a joint unless the two surfaces can be kept in contact; and this is the reason why patients with hip-joint disease experience so much advantage and comfort in being absolutely in the recumbent position. For if they be allowed to be up and about, it is impossible, even with great efforts on the part of muscles already enfeebled by disease, that the easy contact of the two bones, so essential to the accomplishment of anchylosis, can occur. By shortening this young gentleman's leg we enabled the feeble muscles to draw the femur upwards towards the acetabulum, and ultimately the patient did very well. The abscess in the neighborhood of the hip-joint soon discharged its contents, the sinuses closed, the hip-joint became anchylosed, and after a time he went daily into the town, where he was occupied many hours in business. This patient has, since the amputation, had a serious disease and distortion of the spine, and some paralysis of the remaining leg. On the 14th of March, 1860, he reports to me that he was at that time better than he had ever been since he lost his limb, which was ten years ago. In the summer of 1860 I saw him, and then he was in perfectly good health. Here was a case of "strumous" hip-joint disease cured by rest. As regards the knee-joint, that was disposed of in another way, but certainly I think I may legitimately conclude that the hip-joint disease was cured by rest, and that rest could not have been obtained except by placing the patient in a recumbent position for a great length of time, or, as was done, by shortening the limb and diminishing the weight. The anchylosis, or perfect local repair in this case, was accomplished in spite of the scrofulous constitution. In fact, I may say the hip-joint was cured by cutting off the leg.

I would now ask, What is there in a joint, with its epiphyses, which should, independently of local injury, lead to the development of tubercle or scrofula? Joints show no special or peculiar inclination to manifest constitutional tendencies; rather the contrary. We never see cancer beginning in the joint. I believe syphilis in a joint is very rare; this may, however, be, in the opinion of some persons, doubtful; but true malignant disease commencing in the interior of a joint is, as far as my experience goes, unheard of. So with regard to the vicarious influence of gonorrheal discharge, which is frequently said to be the cause of joint disease, I doubt very much its frequency. It is true we meet with gouty deposits in joints, but these occur chiefly in joints already deteriorated, and under the influence of disturbed health, and get well with its improvement. In cases of scarlatina or measles it often happens that, after their subsidence, the patient is the subject of some disease in the joints or the bones. I have seen this occurrence repeatedly, but this, I apprehend, is only the evidence that at the time when the patient came under the influence of scarlatina or measles, the joint or the bone had been the subject of some local injury, which had deteriorated its vitality. The general or constitutional depressing influence of the disease then led to the inflammation of the bone or joint, which especially manifested itself when the

scarlatina or measles was subsiding, or had subsided. If you go into the history of these cases, it will almost always turn out, upon close inquiry, that the patient with diseased bones or diseased joints, as a sequel of scarlatina or measles, had, before the onset of the fever, a blow upon the part, or had used excessive exercise so as to tire himself, and to lower the vital endowments of the bone or the articulation by over-fatigue.* (See Lect. XVI.) I have employed these points for the purpose of indicating my belief that diseases of the joints are not so generally scrofulous as they are reported to be; that is the object of my remarks.

I would ask again, Is a London hospital, or Southwark *par excellence*, if you like, a good locality in which to compete with scrofula? Yet diseases of joints in children do exceedingly well in these places, by allowing them rest and plenty of time. But I hold it to be impossible that joints importantly diseased can be cured with rapidity. When I hear it stated, therefore, by surgeons of hospitals, that they have had cases of diseased hip-joint or knee-joint, which were doing uncommonly well up to three months, the extreme duration of possible residence in the hospital, that then they were obliged to send them away, in accordance with the regulations, I cannot but think that the governors of hospitals who make such laws or regulations prevent joint diseases being cured at these institutions. The period of residence in the hospital being fixed at three months, it is a matter of impossibility that joints importantly diseased can be cured in that time. I am quite sure if the sons or daughters of these governors could be cured of a seriously diseased knee- or hip-joint in one or two, or, perhaps, in some cases, in three years, they would be gratefully delighted. How unfair, then, is the expectation that the same severity of disease can be cured in three months within an hospital! It must require at least many months to cure the diseased hip-joint. I never saw a really diseased hip-joint go through all its stages, and be completely cured, in less than six months; and that I looked upon as an extremely rapid cure. I saw it once, and I was completely astonished. So with respect to the knee-joint: I am quite convinced that limbs are amputated, or, perhaps, some other operation performed, before the proper probationary period for a cure without operation has been allowed to elapse. I hold it to be impossible that knee-joint disease can be cured by anchylosis (and

* This explanation of Mr. Hilton's would seem to me to account for those cases in which joint-inflammation appears very early in a fever, rather than those where it occurs later on, and may be accounted for by some ulceration and suppuration which have appeared in the course of the fever. The subject of pyæmia and inflammation of joints after fevers is one of the most obscure, and withal one of the most interesting, in medicine. It occurs most commonly in the course of scarlatina or measles, sometimes in severer cases where there has been much ulceration of the throat and neck, but also in much milder cases, where it is spoken of as "rheumatism." It also follows the puerperal state, and, as Mr. J. Hutchinson has shown from post-mortem examinations which he made on the parturient ewes which died on his farm, its presence may be explained by a retained and decomposing placenta.

It occurs after variola, and also after typhoid fever, where there is a distinct ulcerative lesion.

Dr. A. P. Stewart has shown how common pyæmia may be in typhus when the cases are crowded together. Finally, joint troubles, probably of a pyæmic nature, and, more rarely, graver and even fatal symptoms of pyæmia, are well known to occur in gonorrhœa.

The fact that pyæmia appears in some of the fevers which have been mentioned above, where no lesion can be detected, must make us careful, I think, not to insist too much on the presence of a suppurating surface as necessary to pyæmia; while such cases as Dr. Stewart's go, I think, further than this, and point to the miasmatic theory of the origin of pyæmia as being a *vera causa*.—[Ed.]

that is the kind of eure to which I now refer), save very rarely, in less than a year. That this opinion is proximately correct will be allowed when we remember the number and variety of soft structures which occupy the interior of this joint. All of these must first become *structurally deteriorated*, and then absorbed. Much the same must happen to the dense laminæ of bone which intervene between the articular cartilage and the cancellous tissue; and, when all this has been effected, the granulating bones must be brought into apposition before the period of direct repair can be said to commence in earnest. All these processes must necessarily require some considerable time for their accomplishment. Again, with respect to the tarsus: it is not to be expected that a disease of one of the tarsal bones or joints can be sufficiently cured so as to render it competent to sustain the weight of the body, except after great length of time.

I will now advert to two or three general considerations, which appear to myself to lead towards the conclusion that local injury is the most frequent starting-point of diseased joints.

The joints of the human body which are the least likely to suffer from internal injury, or from over-exercise or fatigue, are also the most free from disease. This indicates a probable relation between their freedom from external injury or from over-work and their immunity from disease.

The costo-vertebral articulations afford a conspicuous example. These joints are scarcely ever the seat of disease, so far as we can judge, during life; and I think it has happened to few persons to see in any anatomical museum a specimen of uncomplicated anchylosis, or bony union, between the head of the rib and its associated vertebræ. It is true, of course, that in cases of diseased vertebræ, we not unfrequently find anchylosis of the heads of the ribs and the sides of the vertebræ; that is palpable enough; but isolated disease of one of these costo-vertebral joints is exceedingly rare. There are several circumstances which will appear to be the cause of this freedom from disease: one is their mobility; again, external injury can scarcely reach these joints; a third is, that they have their appointed rest; and a fourth might be mentioned, that they do not readily become anchylosed because a band of fibrous tissue is interposed between the head of the rib and the intervertebral substance. This latter fact, however, forms no part of my important argument, because we find anchylosis in the knee-joint, notwithstanding the interposition of large masses of interarticular structures; but this piece of anatomy does not apply to the first, eleventh, and twelfth ribs; yet I have never found any disease between the heads of those ribs and their associated vertebræ.

I had a patient—he is still alive, and therefore I have not an opportunity of presenting to you a pathological specimen—who had a diseased spine which was caused by a blow on the lower part of the cervical region. He is now actively employed in business, and is thirty-two or thirty-three years of age. After being about four years in a recumbent position, he is now again able to occupy himself fully in business, and yet not one of his ribs moves during respiration. If you were to look at his naked, broad, well-formed chest, and put your hands upon his ribs, you would find that not a single one of them moves during respiration ; all the breathing takes place by the aid of the diaphragm and the abdominal muscles. The actual condition of this gentleman's costo-vertebral joints is very doubtful.*

* This gentleman is now dead. He lived for twelve years after his ribs became fixed, and was able to return to business, remaining for several years engaged on the

This freedom from disease is a remarkable thing in joints so actively employed as are the costo-vertebral joints, day and night, and it requires a few words of explanation or reference. As I have already said, there are two circumstances that may contribute to the freedom from disease of these joints. It must be admitted, I think, that scrofulous tendencies or diseases manifest themselves mostly in early life; and the earlier in life, in proportion to the intensity of the constitutional taint. It is at this same early period of life that the costo-vertebral joints are the most actively employed in relation to rapid breathing, and the bones, as well as the soft parts of those joints, must be under the full influence of friction, pressure, and tension — conditions likely, in the minds of some, to induce the local development of the constitutional taint, as in the lungs. Notwithstanding those sources of structural deterioration, these joints escape disease, because they scarcely ever suffer from direct local injury; indeed, they are so deeply placed, and so strongly connected by ligaments, that direct injury from without can hardly reach them. Broken ribs, as we all know, are frequent enough; and no doubt, if the heads of these ribs were not maintained strongly in their position, they might be frequently displaced. Reflecting again physiologically on the costo-vertebral articulations, we must remember that, although on occasion of any exertion their movements may be excited temporarily by volition, yet the respiratory movements must soon subside to their normal state of comparative quietude, and during sleep these articulations must have a certain amount of repose in accordance with the diminished frequency of respiration. Under all circumstances, they may be said to have the advantage of what may be called their appointed rest—and this rest might

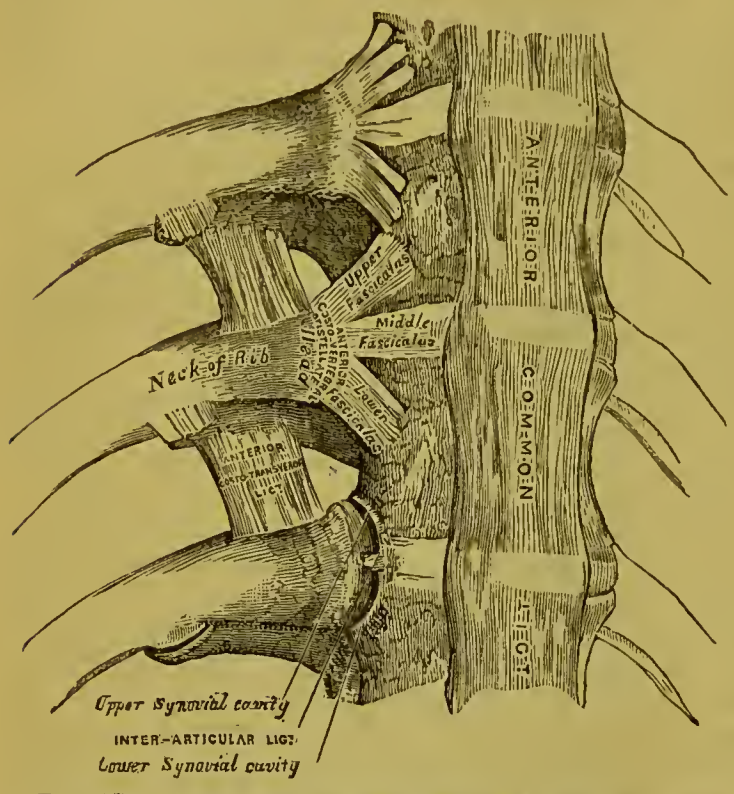


FIG.—57. Costo-vertebral and costo-transverse articulations. Copied by permission from Gray's Anatomy.

Stock Exchange. During this period he had hæmoptysis several times, but, as no structural change could be detected in the lungs, Mr. Hilton advised him to look upon the hæmorrhage as a means adopted by Nature for giving relief to the lungs in their fixed condition. Later on the gentleman removed to Devonshire, and here, after exposure to the cold, he died rapidly after a sudden attack of pneumonia. This was marked by its great severity, the distress in breathing being much aggravated by the fixed state of his ribs, a condition which contributed a great deal to his speedy death. There was no post-mortem examination to ascertain the nature of the old injury, and the condition of the costo-vertebral joints.—[ED.]

certainly be termed Nature's strong conservative principle, strongly marked in parts the freedom of which from disease is most necessary for active life.

It has occurred but to few persons, perhaps, to note the number of time that these articular surfaces are rubbed upon each other during respiration; but here are the figures representing the facts. I have taken the case of a child five years old, and the number of respirations at thirty in a minute (about twenty-six is said to be the number); this would give 1,800 in an hour, 43,200 in a day, and the enormous amount of 15,768,000 respirations in a year. Every respiration consists of two movements—inspiration (ascending) and expiration (descending), so that the friction must be double. Consequently, at five years of age, the number of movements is about 31,536,000 in the year, and yet these joints are never diseased. The chief explanatory conditions are their not being exposed to external injury, and that they have their appointed rest.

Diseases of the pelvic bones or articulations in children are but seldom seen, except at the acetabulum as part of hip-joint disease. I believe that the cause of freedom from disease in the articulations of the pelvis depends upon their immunity from local injury by accident or by over-exertion. One of these joints is here shown (Fig. 58) between the sacrum and the os innominatum, and you see a large mass of ligamentous and cartilaginous tissue represented as lying between these two pelvic bones. These joints are very seldom diseased.

Let us ask ourselves what inference can be drawn from the hosts of old dislocated limbs, due to previously diseased joints (especially the hip and knee), which we meet with in the streets and amongst the poor in an hospital? What do these cases convey to the mind of an observing and reflecting surgeon? The facts speak for themselves; they all tell him in the strongest language which crippled Nature and deformed humanity can use, that the disease of the joint was not scrofulous; or that at least, if scrofulous, in spite of the adverse circumstances of constitutional taint, poverty, home discomforts, foul air, improper and defective food, and unconstrained muscular disturbance, or forced exertion for the sake of livelihood—that, notwithstanding all these drawbacks, and probably also the absence of good professional care, Nature has succeeded in relieving the patient, either by forming a new but imperfect articulation for the dislocated bone, or, finally, by consolidating the two or more bones which lie in contact in their displaced positions. Again I say, let the surgeon ask himself what might have prevented the



Fig. 58.—In this sketch is shown the position of the strong material interposed between the sacrum and ilium, by making a horizontal section of the ossa innominata and sacrum.

a, Sacrum. *b*, Os innominatum. *c*, Ligamentous and cartilaginous tissues joining the bones.

disease progressing to such an extent of severity?—what would have shortened or prevented the extreme suffering which the patient must have experienced?—what would have averted the deformity, and what would have secured for the patient, if not a complete cure, certainly a strong and useful limb, without displacement and with little lameness? On reflection, I believe he will reply, Rest, local rest, by fixing the limb in a proper splint, aided by time, Nature's powerful coadjutor.

An argument, supported by facts, against diseases of joints being considered simply the expression of constitutional taint, and in favor of local injury being the earliest and true cause of articular disease, may be found in the relative frequency of diseased joints in the lower as compared with the upper extremities. There will be no hesitation in admitting that diseases of the hip-joint are far more numerous than diseases of the shoulder-joint; and that the only additional local disturbance to which the hip would be liable would be that resulting from frequent fatigue, over-exertion, or direct injury. The same with respect to the knee and the elbow; no one can doubt the greater frequency of disease in the knee-joint as compared with that of the elbow. Here, again, the same explanation would apply—viz. the greater probability of accident or of over-exertion (which is structural and physiological exhaustion), and of continuation of fatiguing exercise.

It has fallen to the lot of but few surgeons to see many cases of isolated disease of the superior articulation of the tibia and fibula; yet that joint lies very close to that of the knee, which suffers such frequent disorganization. This superior tibio-fibular joint is, however, seldom the seat of direct injury; hence its freedom from disease, except it be as an extension from the knee-joint.

With regard to diseases of the ankle and wrist, I do not know how they may stand with respect to each other numerically, but certainly we often see disease or enlargement of the base of the radius in children. Now, I think it must have been observed, that whenever a child falls, the hand is put out to prevent its being hurt, and the whole impulse must concentrate itself upon the base of the radius. This is no exaggerated idea. Is it not so with adults in daily life? If we fall, we put forth the outspread hand to prevent mischief; and what happens? Why, the base of the radius is broken by the impulse conveyed from the convexity of the upper row of carpal bones of the hand, and the radius is thus split or fractured. We more frequently meet with disease in the phalanges of the fingers than in the phalanges of the toes; this fact, I apprehend, is to be referred to the circumstance that in falling or in other fortuitous accidents, injuries to the phalanges of the hands are much more likely to occur than to the corresponding bones of the feet.

In small accidents to the joints, a great deal of injury to the internal parts sometimes takes place without its being seen. Some years ago I had an opportunity of observing this occurrence. A man going across Blackheath, rather the worse for liquor, fell down or jumped six or eight feet into a gravel-pit, and alighting upon his feet, his leg was very severely broken. I amputated the limb below the knee. On examining the ankle-joint, which apparently had not been injured, I found the articular cartilage upon the astragalus actually depressed at one part, and at another part I saw within it a large black, deep patch, and upon carefully cutting off that portion of articular cartilage, and bringing it up to Mr. Quekett, it turned out to be extravasation of blood, or ecchymosis; this local injury or bruise had no doubt occurred from the impulse of the

tibia falling upon and bruising the astragalus on its upper surface. This mischief to the articular cartilage would probably have led to disease in the ankle-joint, as the secondary consequence of the accident.

These points are adduced for the purpose of combating the belief which seems to prevail with respect to the generally scrofulous character of diseased joints. That this is an error is shown when we note the greater frequency of diseased bones and joints in the outer side compared with the inner side of the foot in children. Now, there must be some reason for this difference. I believe there are two or three causes which determine and explain this relative frequency — namely, that the outer side of the foot is more exposed to the result of direct accident, and that it has to sustain the weight of the body in an erect posture; it is, moreover, that portion of the foot which, during progression or walking, receives the chief concussion between the weight of the body above and the resistance of the ground below. Thus the outer side of the foot becomes more likely to suffer local injury from fatigue and continued exertion. Mr. Ward, who published one of the best and most philosophical works ever written upon the human skeleton, divided the foot longitudinally into two portions—the inner side, or the elastic portion, which includes the astragalus, the scaphoid, and the three cuneiform with the three inner metatarsal bones; and the outer portion, the strong side of the foot, comprising the cuboid bone, the os calcis, and the metatarsal bones of the fourth and fifth toes. It was my custom at Guy's to refer to this subject, not precisely in the same way as Mr. Ward, but to show that in order of development and ossification of the bones, the strong part, or outer side, of the foot takes some precedence of the other. These facts are well depicted in Quain's Anatomy, ed. 8th, vol. i. pp. 121, 122. We there see the early ossification of the os calcis and the cuboid, and the late ossification of the other or elastic group of bones; and it is especially worthy of notice that the scaphoid is the last to complete its growth as well as its ossification. In fact, it is this bone which completes and determines the elastic configuration of the foot. The os calcis and the cuboid bone are the first of the tarsal bones to be ossified, preparatory to their having to sustain the weight of the body in progression or ordinary exercise. We know, as a matter of fact, that children are often compelled to continue their walking exercise notwithstanding fatigue — which is muscular exhaustion—and thus not only the frequency of diseased tarsus at that age is explained, but also the peculiarity of the position of it—that is, on the outer side of the foot, in the os calcis or the cuboid.

We very rarely see disease in the sterno-clavicular articulation in children or in adults. It is also rarely the seat of local injury.

I might also remark, that the success attending the operation for excision of joints tends very much to the same conclusion; for if all the diseased joints in children, or the majority of them, are the results of a scrofulous state beginning in the bones, how does it happen that these cases do so remarkably well when the joints are simply excised, when the bones ought to be unhealthy? The bones which ought to be unhealthy and scrofulous do unite and become consolidated in such a way as to render the limb, although a shortened, yet a very useful one.

Arguing for, and urging the importance of, rest in the treatment of diseased joints, it becomes important that I should answer one or two objections. Two arguments are advanced against the employment of long-continued rest in the treatment of diseased joints—viz. deterioration of the general health, and anchylosis of the articular ends of the bones pre-

viously healthy. Now, as regards the deterioration of health, all I can say positively is this: that, taking for illustration extreme cases of diseased hip-joint, I have never yet seen a case of severe hip-joint disease in which the general health has not been benefited by quiet and rest, even in a public hospital, more or less vitiated as the air of such a place must necessarily be, and I shall by-and-by mention cases confirmatory of this statement.

Many persons, however, believe that the joints, their soft parts especially, being unused and kept in restraint, although not at the time actually diseased, may suffer irreparable structural change or deterioration by long-continued rest, and that healthy joints may become anchylosed as the consequence solely of that rest.* This opinion is advanced as an argument against the employment of long-continued rest to diseased joints. Now, I doubt the soundness of this conclusion; nay, indeed, I believe that it is essentially untrue. It is possible, and may be probable, that a temporary alteration and a diminished elasticity of articular cartilage may occur; that the ligaments may become feeble, and the synovial membrane unmindful of its duties, without the stimulus of friction; that the bones may lose their firmness, and the muscles their strength, from disuse; but such deteriorations are only temporary, for reparation is perfected in all these structures by careful and steadily increasing use or employment, and after a time they show no defect. For example, if the knee-joint be seriously diseased and the soft parts destroyed, in such a case a long-continued period of rest to the whole limb, as well as to the diseased joint itself, is required to bring about anchylosis, or bony union; yet the unused foot, ankle, and hip-joint are not damaged; they are ready for careful employment when their activity and structural energy are required.

In chronic diseases of the knee-joint after long-continued rest, requiring amputation, on examining the interior of the joint after removal, we sometimes see that when the whole of the joint may be said to have been more or less diseased, and the whole of it has been kept certainly in a state of quietude or rest for a considerable period anterior to amputation, the patella is fixed by bone upon the condyles of the femur. But, on the other hand, we see cases of extensive disease of the knee-joint requiring amputation, where, after amputation, we raise the movable patella, and find that a separate distinct joint exists between it and the condyles of the femur, each part preserving its proper quantity of articular cartilage. Here is a case (Fig. 60), to which I am about to refer, showing that articular structures kept close to each other for a considerable time do not become anchylosed by rest, but may remain comparatively healthy, notwithstanding that the adjoining part of the joint shall be completely destroyed. These circumstances seem to me to point to the conclusion that the soft parts of joints are not necessarily damaged, although kept a long time at rest.

* Thus Sir J. Paget (Clin. Lect., p. 97) speaks as follows:—"I have seen adhesions in the ankle-joints of legs amputated after being long at rest, though the joints had not been evidently inflamed; and Mr. Butlin has related (Trans. Path. Soc., vol. xxv. p. 212) a case of anchylosis of a knee-joint in a limb which was long kept straight for the treatment of a fractured femur."

Interesting as these cases, especially the last, undoubtedly are, they should not be strained in order to prove that anchylosis will follow in perfectly healthy joints merely because they have been kept long at rest. Thus, in Mr. Butlin's case, the fall which fractured the femur (the exact seat of the fracture is not given) may have caused mischief at the time to the knee-joint, slight, but sufficient to lay the foundation of the subsequent fibrous anchylosis in a woman at fifty, about whose constitutional history or tendencies nothing is stated.—[Ed.]

On looking at the late Mr. Bransby Cooper's description of a Chinese lady's feet, I find no mention made of any disease of the structures forming the articulations. The joints are distorted, and the whole foot dwarfed by rest and pressure; yet, as far as I can see on examining the dried preparation, no bony anchylosis has occurred in any of the articulations.

It so happens that this College is rich at this time in Chinese ladies' feet, and I place before you a very good specimen, which I shall employ for the purpose of sustaining the view that I entertain regarding the non-deteriorating influence of rest on healthy joints. Fig. 59 is a drawing of a preparation preserved in spirits. I do not know how old the lady was, but, looking to the appearance of the bones, we may fairly presume that she had arrived at, or beyond, the age of puberty. Now, these joints have been compressed upon each other during perhaps twenty or thirty years, and yet their surfaces are in a perfect condition: and the articular structures are not in the slightest degree deteriorated by it. If one were asked to produce a notable instance where pressure and constrained position are exerted upon joints by the strong competition carried on for many years between the efforts of Nature from within and the application of brute (though human) force from outside, without producing injury to them, this is surely the one. Yet there never was a case in which the conclusion could be more manifest than in this, for the articular surfaces are perfectly entire and healthy. In a note that I had from Mr. Bader, one of the curators of the College Museum, on the 23rd of January, 1861, he says, "The articular cartilages from the articulation of the Chinese foot are microscopically perfectly healthy." This illustration ought, I think, to displace the needless fear and apprehension, that the continued mechanical rest of joints may lead to their irreparable deterioration.



FIG. 59.—This sketch represents a vertical section of the foot of a Chinese lady. The specimen belongs to the College of Surgeons, and has been preserved in spirits of wine. The bones are numbered.

1, Tibia. 2, Astragalus. 3, 3, Os calcis. 4, Scaphoid. 5, Cuneiform. 6, Metatarsal bone, with phalanges appended.

It may be noted that all the joints between the different bones remain perfect, although the shapes and directions of the articular surfaces have been rendered very abnormal by rest and long-continued mechanical pressure upon the foot.

To take another instance. If you strap up a foot firmly in order to cure disease of one of the tarsal joints, do the other tarsal joints become anchylosed? Certainly not necessarily. Here (Fig. 60) is an illustration of this fact. It is the foot of a young man whose limb I removed for disease of the knee-joint. Upon the inner side of the foot there may be seen a well-marked specimen of anchylosis between the scaphoid bone and the astragalus; yet the joints nearest to it are not in any way involved in that mischief; there is no anchylosis; they are perfectly healthy. The anchylosis had taken place about two years previously to the amputation of the limb. It is a very typical instance of anchylosis, and I employ it for the purpose to which I am now referring, namely, to show that, although pressure by strapping the foot, quiet, and rest were resorted to during a long period, in order to cure the disease between the astragalus and scaphoid, yet the

only two bones which became anchylosed were those between which the joint was in an unhealthy condition.

Again, in a case of severe cut throat, is the larynx voiceless after a rest of six, seven, eight, or ten weeks? or is a stomach, after a patient has been fed by enemata for three weeks, incompetent to resume its duties of digestion, if provided carefully with food and a small amount of necessary exercise? Certainly not. In cases of cataract, either congenital or of recent date, is the retina after an operation incapacitated to receive the rays of light carefully introduced into the organ? Certainly not. Then, I say, if all this be true, what right have we to expect that a joint should present different phenomena?

I think I have advanced facts enough to induce those gentlemen who entertain the opinion that scrofula is so very constantly the cause of mischief in diseased joints, to admit that other causes, such as a chronic inflammatory condition and slight local injury, are by far the most frequent; and, further, that rest to healthy joints does not induce disease leading to anchylosis. I might here say, that, in teaching on this subject at Guy's Hospital, now many years ago, I used to take occasion to point out, to those whom I had the honor of instructing, that the generally received impression that scrofula is, as a rule, the foundation of joint diseases, is really not true.

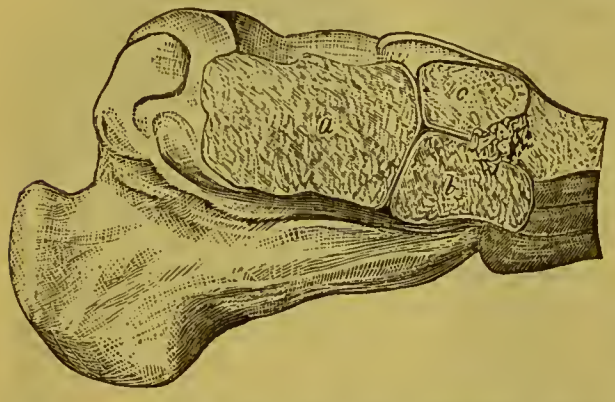


Fig. 60.—This drawing from nature represents a longitudinal section of the foot, so made as to display the complete bony consolidation or anchylosis of the head of the astragalus with the concave articular surface of the scaphoid bone, whilst the joints between the scaphoid and cuneiform bones remain in a distinctly healthy condition.

a, Astragalus and scaphoid bones consolidated. *b*, Internal cuneiform bone. *c*, Middle cuneiform bone.

This section was made obliquely, so as as to show parts of two of the cuneiform articulations, with the scaphoid bone.

It is not stating too much to say that the diseases of joints are modified by age, especially in one or two respects. In the adult period of life we see disease of the individual articular structures, whether of synovial membrane or bone, and we observe that not only is the progress of the disease usually slow, but the progress of repair at that period is also slow. In children, however, we note a very quick implication, if we may so term it, of all the articular structures in disease, and quick destruction of the parts, and subsequently very speedy repair. In young children this progress is very rapid in acute disease. I have here the outline of a cast of an anchylosed knee-joint. It does not, perhaps, represent a specimen of perfect surgery, but it indicates the rapidity of repair in a young person. The boy was three and a half years old, when he fell from a window, and damaged his knee. The injury led to suppuration within the joint, and enormous swelling around it; absorption of all the true articular structures, and ultimately to complete bony anchylosis. The whole of this was accomplished in a few months.

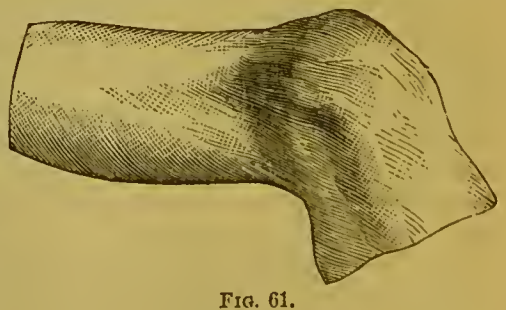


Fig. 61.

But I advance this case in reference to another and very important point. It is a common thing for surgeons to conclude that a joint is irreparably damaged when they hear or feel the articular ends of the bones grating upon each other. Now, I had a good opportunity of testing the value of that point in this child when he was very ill, and the joint was very much swollen, and suppuration going on in it. My dresser said to me, "When dressing this leg, I can hear and feel the bones grating upon each other;" and he rather looked upon this symptom as fatal to any probability of the repair of the joint. I remarked to him, "Before we amputate this limb we will look into the interior of the joint." I made a free incision into the joint, on its inner side, and washed out all the purulent fluid; and then I saw the dense articular laminæ of bone still upon the femur and upon the tibia, and, on rubbing them together, the harsh, grating sound was produced. The internal soft parts of the joint were all destroyed. I saw that the articular laminæ on the bones presented a worm-eaten, or minutely cribriform, appearance, indicating that interstitial absorption of the laminæ was going on; and I came to the conclusion that it would be completely absorbed. I therefore secured the bones in as easy and as accurate apposition as I could. I wished to divide the tendons of the flexors; but it was determined by the father that as the child was so ill he would not permit him to be touched any more in the way of operation; therefore we did the best we could with mechanical appliances to prevent flexion of the knee-joint, and ultimately the boy got well, and can now walk a mile or a mile and a half with facility. In this case I touched the interior of the joint with my finger, and I saw distinctly what was the cause of the grating sensation when the surfaces were moved upon each other. It arose clearly from the persistence, for a time, of the articular laminæ which exist between the cancellated structure of the bones and the articular cartilage. The sub-articular bony laminæ are, as we all know, very dense, compact structures, and it is intelligible how it occurs that when these surfaces are brought together they create the hard, grating sensation which we so frequently hear and feel on examining diseased joints.

As another practical application of this point, I may say that the fact of this grating sensation sometimes determines in the minds of surgeons the propriety of excision or amputation. Now, it should not be overlooked that there must be a period in every joint disease which is to be cured by anchylosis when this grating sensation is to be experienced, and that is before the articular lamina is actually removed by absorption. When the articular lamina is removed, consolidation can take place, but just before that period it is plain that the friction or rubbing of two layers of compact bone upon each other may produce a rough grating, and might lead unjustly to the conclusion, that those portions of the bone which ought to be in a healthy condition in order to secure subsequent anchylosis are irreparably diseased. I have repeatedly heard and felt this grating noise in the fingers, ankle, hip, and other articulations, and yet the patient's joints have done well by anchylosis.

I purpose placing before you the fact, that diseases of the joints in children follow a peculiar course, and one not perfectly in correspondence with that which obtains with respect to adults. In adults the individual structures of a joint may be diseased, and each may present its own local indications, or special local symptoms. Thus, we may meet with isolated inflammation of the synovial membranes and ligaments, or a disease of the articular ends of the bones in the adult. Now, although these structures

are at all periods of life necessarily continuous with each other, and closely allied in function, yet it is at the adult period—after the completion of their development—that each separate structure seems to have acquired, and thenceforward to manifest both in health and disease, a structural independence which gives a character of individuality and isolation to the diseases of the different structures of the joint.

In children all the structures of the joint must be formed, built up, and nourished in concert and in due relation to each other. On this intimate sympathy existing between the different parts of a joint during childhood, or during the period of growth, depends the tendency to diffuse disease contemporancously in all the articular structures. Hence we see in our practice the quick propagation of inflammation from one articular structure to another, and a rapidity of implication of the various structures of the joint in childhood and youth, which we do not observe at a later period of life.

It is, therefore, to my mind—and this is no new idea, for I have taught it publicly for many years—an unsubstantiated refinement in most cases of joint disease in childhood to attempt to depict the symptoms indicating distinct or separate pathological states of the individual structures composing a joint. It is certainly not in accordance with clinical experience and surely it is not a sound basis upon which to fix and determine the plan of treatment.

This close sympathy between different structures both in growth and in disease, met with in children, is not peculiar to the joints alone; it is the great feature, it is the pathological type, which this young period of life constantly displays in other parts of the body. Some of those gentlemen whom I now address know better than myself, and I take it upon the statement of those in whom I have confidence, that in adults you meet with pneumonia as a separate disease; you may see pleurisy as a separate disease, or bronchitis as a separate disease, each recognized by distinct symptoms, and each treated in reference to the morbid condition. But not so in childhood; at that period of life you scarcely ever meet with pleurisy, pneumonia, and bronchitis as distinct inflammations. They all appear together, or there is a general and rapid implication of all these structures nearly at the same time.

It is the same in diseases of the brain. It is a common thing to see disease of the membranes or disease of individual parts of the brain in the adult; yet it is rare to see these in the same distinct and isolated manner during childhood. In disease of the larynx in children all the soft parts become equally involved; whilst in adult life, when the laryngeal structures seem to have acquired a normal independence, which they had not in earlier life, they appear to possess the same kind and degree of independence in disease.

Now, I think we have here a feature of high physiological and pathological importance, and very suggestive as a guide to treatment in practice—viz. the difference between the relative progress and implication of the various structures of diseased joints in childhood and in manhood. In children vigor and rapidity as to the diffusion and progress of inflammatory conditions, as well as rapidity of repair, stand in very strong and distinct antagonism to the like conditions (in all other respects similar) which may attack the same structures, but at a more advanced period of life.

LECTURE XIV.

Hip-joint Disease not Necessarily Scrofulous—Importance of Diagnosing Hip-joint Disease in an Early Stage—Distribution of Nerves to the Hip-joint—Earliest Symptoms of Hip-joint Disease—Disease of Shoulder-joint not Kept at Rest, Joint Destroyed; Hip-joint Disease in the Same Patient Cured by Rest—Dwarfed Pelvis as a Result of Hip-joint Disease—Diseased Hip-joint Cured by Five Months' Rest—Another Case of Twelve Months' Standing Cured by Seven Months' Rest—Hip Disease in a Scrofulous Patient Cured by Rest—Diseased Hip-joint, Limb Bent, Straightened Under Influence of Chloroform, and Cured by Rest—Dislocation on Dorsum Ilii from Disease Reduced, Anchylosis Proceeding—Similar Case, Dislocation Twice Reduced.

It will be the object of this lecture to direct your attention to diseases of the hip-joint, and to demonstrate the value of rest as a therapeutic agent in such cases.

I may commence this subject by observing, that in most systematic works on Surgery, whilst diseases of the joints are arranged under one head, there is generally a separate chapter devoted to morbus coxæ, or morbus coxarius as it is termed. We are thus led to entertain the idea that there is some special peculiarity with respect to the diseases and symptoms, or the pathological anatomy of the hip-joint, I believe this to be a mistaken idea. So far as I know there is nothing in any way special or peculiar as regards the structures or the diseases of the hip-joint, when compared with those of other joints. Their physiological and pathological conditions are in no way peculiar, being obedient to the same laws which are observed to prevail in other joints. Nor do I believe that there is anything distinct in the constitutional tendency of hip-joint disease, though it seems to me that professional opinion points to the hip-joint as emphatically the chosen seat, or special locality, for the manifestation of scrofulous disease of joints. This, to my mind, is a great error—an error, also, which has a very bad influence. If we understand by the term scrofula a constitution highly cachectic, tuberculous, or at any rate disposed to the formation of tubercle, or with tubercle already existing in the diseased part, then if we regard a case of hip-joint disease as purely scrofulous in this manner, the prospect of relief to the patient will appear very small (something like that which may be expected by a person who is suffering from pulmonary consumption, with the probability of an early death before him), and the treatment will thenceforth be likely to assume a palliative rather than a strictly curative character. If the surgeon affix such an idea to every case, or to the majority of cases of hip-joint disease coming under his notice, he will feel little disposed to adopt anything like a persevering plan in his practice, and without such a plan he will surely fail in the proper treatment of the disease.

Another error often committed is one which we have inherited from a previous generation of surgeons, the entail of which I should like to see cut off. It was, and is now in some places, the disposition of surgeons to

require that the patient suffering from hip-joint disease should manifest those marked symptoms which are deemed to be characteristic of hip disease, such as the shortening or the lengthening of the limb, a fulness or flatness over the gluteal region, want of symmetry in the sub-glutcal folds, pain at the inner side of the knee, greatly disturbed health, and considerable lameness. Now, the very fact of its being the opinion of some surgeons that shortening of the limb is characteristic of the disease, and of others, that lengthening of the limb is characteristic of it; of some, that there should be a want of symmetry in the gluteal region, and of others, that the symmetry is not necessarily altered—all this, I think, is a satisfactory proof that these symptoms may fail as direct and positive indications. As far, however, as I have been able to judge, lengthening or shortening of the limb in the early stage of the disease is almost always the result of inclination of the pelvis. I have taken great care and trouble to determine this point, by carefully measuring and comparing the two limbs, and I do not know that I have ever seen a case of well-marked uncomplicated hip-joint disease where there was a difference in the measurement in which the lengthening or shortening did not depend upon the inclination of the pelvis. I am not speaking of cases of advanced disease about the joint, nor of cases of dislocation from disease. These highly characteristic symptoms which are put prominently forward as indicating disease of the hip-joint are not the early symptoms of hip-joint disease. When we see such symptoms, we may be sure that the disease in the joint has made considerable progress. It seems to me, therefore, that we should search for the local symptoms which precede the period referred to, for when these symptoms stand out so prominently and distinctly as to be recognizable by anybody, the local mischief must be great, and there can be but little professional credit in "making out" the cause of the symptoms. It is highly important that the surgeon should recognize the diseased condition of the joint previous to that period, for that is the time when the most beneficial effects will follow a steady and long-pursued plan of treatment by rest.

If we succeed in an early diagnosis of disease of the hip-joint, I am quite confident that it will not fall to the lot of surgeons to see those sad and sometimes hideous cases which we so frequently observe, more particularly in hospital practice. It is, I think, a most serious fault for surgeons to assume that there is nothing wrong in the hip-joint, unless some of those very conspicuous symptoms be present. The all-important point is the early recognition of the first deviation from a healthy state; and I would anxiously urge upon you, that even a suspected state of disease justifies a plan of treatment by rest, which, in my belief, would, in the majority of such doubtful cases, be the means of preventing the occurrence of the more formidable symptoms. I would venture to affirm, that if even the more advanced and more formidable symptoms be displayed, still the case may be amenable to the influence of rest, and this I hope to prove by illustrative cases.

Referring to hip-joint disease in children, let me say, it will be especially important for the surgeon to bear in mind that the acetabulum in a child is very shallow compared with that of an adult. It thus offers great facility for displacement. This I apprehend may be the reason why there is so often a tendency to dislocation of the thigh-bone in hip-joint disease at an early period of life. I do not know that this is the only element which determines this dislocation, but I think it may be considered an influential one. I shall not dwell upon the anatomy of the hip-joint, except to remind you that its muscles perform their functions in groups,

that each group has a trunk nerve of its own, and that each nerve contributes a branch to the hip-joint itself. In Figs. 62 and 63 you see a branch of the anterior crural nerve passing to the hip-joint; a branch of the obturator going to the capsular ligament and to the ligamentum teres; and a branch proceeding to the posterior aspect of the hip-joint from the sacral plexus which supplies the gemelli, the quadratus femoris, and the obturator internus. This anatomy should be borne in mind, because it explains how it happens that the remote and sympathetic pains associated with an inflammatory condition or chronic disease of the hip-joint are not always found in the same part of the limb. We all know very

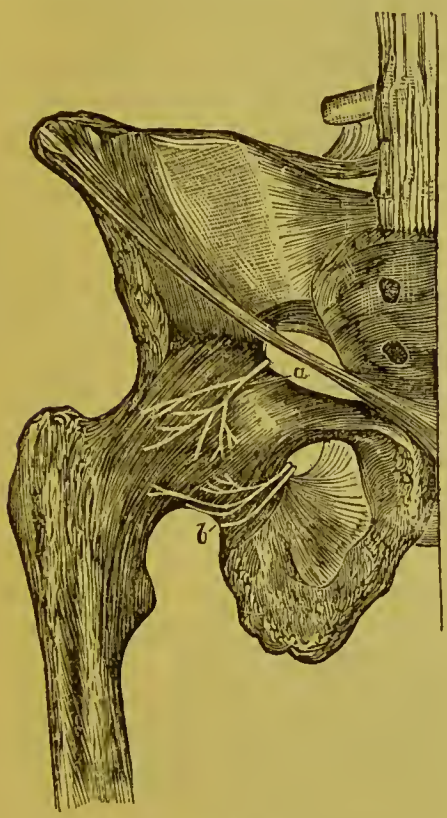


Fig. 62.

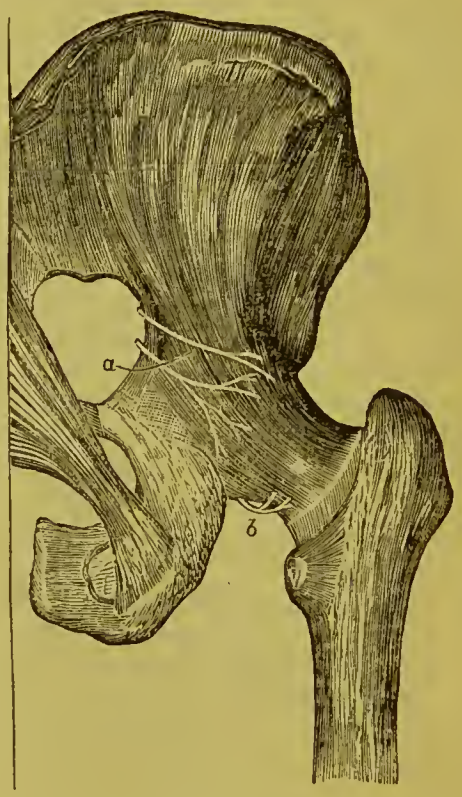


Fig. 63.

Fig. 62.—Sketch of nerves supplying the anterior and inner parts of the capsular ligament of the hip-joint. *a*. Filaments from the anterior crural nerve. *b*, Filaments from the obturator nerve.

Fig. 63.—This drawing represents some of the articular nerves of the hip-joint. It is a view of the posterior aspect of that articulation. *a*, Branches of nerves from sacral plexus. *b*, Terminal filaments of the obturator nerve.

well that, in some cases of hip-joint disease, one of the earliest symptoms is remote from the actual seat of mischief—namely, pain within the knee, or on the inner side of the knee-joint; and we are familiar with the explanation of it—namely, that the obturator nerve, which contributes a branch to the ligamentum teres, sends a branch to the interior of the knee-joint, to the inner side of it, and sometimes even lower down. The inflammation or a diseased condition of this ligament necessarily involves the little branch of the obturator nerve, and a "sympathetic" pain is produced at the other end of the same nerve, on the inner side of the knee or within the knee-joint. As it is frequently with the obturator, so it ought to be sometimes with respect to the other nerves of the hip-joint; but the frequency of this knee pain, whether within the knee-joint or on its inner side, indicates that the ligamentum teres is the most common

seat of early disease. We observe this same "sympathetic" pain in old persons, who may or may not have had a slight injury to the hip, but in whom the ligamentum teres softens down and disappears. Such persons often complain of severe pain within or on the inner side of the knee-joint. Some years ago I saw a case in which, after injury to the hip, this symptom of pain in the knee-joint was well and early marked. Afterwards the limb was slightly shortened, and the foot everted, imitating the reputed symptoms of fractured neck of the thigh-bone. I subsequently examined this patient's hip-joint, and found that the injury was confined to the ligamentum teres.

Now, suppose the anterior part of the capsular ligament (which receives a branch from the anterior crural) is inflamed, applying the same law, you will see how it may happen that a patient with a diseased hip-joint may have pain on the front of the knee, or on the inner side of the ankle, because the anterior crural never sends branches to these particular spots. Or if the inflammation or injury begins at the posterior part of the capsular ligament, which receives a branch or branches from the sacral plexus, then the patient may have a "sympathetic" pain actually at the heel or in the foot. I repeat these remarks in reference to the nervous supply, because an impression, I think, is abroad that the "sympathetic" pain of hip-joint disease is always on the inner side of the knee-joint, and that this local symptom is essential to a correct diagnosis. This, it seems to me, is not true. I admit its greater frequency, because, as has been already intimated (p. 126), the ligamentum teres is, perhaps, the part where hip-joint disease in reality most commonly begins, and this corresponds with the frequent observation of the "sympathetic" pain on the inner side of or within the knee. To put this point more strongly: it sometimes happens in hip-joint disease that there is no pain in the knee-joint at all (I have seen several such cases); this local pain, therefore, must be considered as a fortuitous, not a constant, symptom, and not always to be relied upon as indicative of diseased hip-joint.

We ought further to bear in mind that the hip-joint lies very deeply, and that therefore one of the earliest symptoms of an inflammatory condition—a sense of heat in the part—is not likely to be recognized early in the disease except by careful manipulation. There is no local symptom which characterizes the inflammatory condition of a joint so certainly as the increase of temperature in and over the part inflamed. This is one of the symptoms on which every surgeon may positively rely when examining a suspected disease of any joint, provided he is able to make accurate manual examination of it, in reference to the existence or non-existence of an inflammatory condition. When this local symptom of increased heat exists, it is absolutely satisfactory.* But you will observe it is one of the symptoms which you may not be able to reach in a very early stage of hip-joint disease, because the joint which is the seat of the inflammatory heat lies so deeply, and is covered at some parts by such a large mass of soft structures, that it is difficult for the hand to appreciate an increase of temperature on the surface. When, however, with the other symptoms

* Of the importance of an increase of temperature Sir J. Paget speaks as follows (Clin. Lect. and Essays, edited by Mr. Howard Marsh, p. 214):—"But, after all, the sign most to be relied upon for diagnosis between real and nervous disease of joints is the temperature. It is so important to estimate it accurately that I cannot too strongly urge you to be always studying it. . . ." For the best information we have on this subject the reader should consult, *loc. supr. cit.*, pp. 120—121, and 135—137.—[Ed.]

of lameness and tenderness to which I will presently allude, you find an increase of heat in the neighborhood of the hip-joint, you may be sure of the existence of a subjacent inflammatory condition.

Here, then, we see two sources of fallacy which have existed in the diagnosis of hip disease: one as to the position of the sympathetic pains, and the other as to the non-existence of heat. If we say that the "sympathetic" pain is always on the inner side of or within the knee, and we are called to a case where it does not exist, of course it excludes from our consideration hip-joint disease. Or if we say that every inflamed joint is marked by an increase of heat, and we are called to a case where this does not exist (but I think it is very rarely absent), of course that again would exclude hip-joint disease from our consideration.

There is another source of difficulty in the diagnosis, to which I shall refer again (Lect. XVI.), namely, cerebral or spinal-marrow disease, which may induce or cause some of the physical signs of hip-joint disease.

Now let us consider what may be the earliest symptoms of hip-joint disease in children. Here I may remark that I cannot conceive why it is that surgeons do not examine the hip-joint itself in the same exact, direct, and methodical manner that they employ in the examination of other joints: why, in examining a suspected or obscure case of disease in the neighborhood of the hip-joint, they should depend upon, or place so much reliance on, what might be called the outlying symptoms. If we are desirous of ascertaining the nature of an abnormal condition of the ankle, knee, elbow, or shoulder joints, we try to make out the actual condition by close and precise manual examination of the joint in reference to the exact site of the pain, the sense of heat at the joint, and the influence of direct friction or pressure upon the articular surfaces. But, with regard to the hip-joint, many surgeons seem to be satisfied with merely examining the general features of the case in order to recognize those outlying symptoms which are described in books as characteristic and indicative of hip-joint disease.

If we see a child with a slight degree of limping or lameness in walking, that must depend upon something. If a child is suffering from a slight degree of lameness in walking, and we recognize no indication of an inflammatory state by the increase of heat in the ankle or the knee-joint or the foot, and no pain at all on isolated or definite pressure by the hand at either of these parts, we may be certain that the mischief is not there, and we may be pretty confident that it will be most probably found at one of the pelvic joints, or in the immediate neighborhood of the hip-joint, either within the articulation itself or the epiphyses of the bones. Possibly, on placing the hand attentively upon these latter parts, the precise seat of the mischief may be detected by a greater or less increase of temperature at that spot, and this symptom is usually, and more especially, manifested towards evening, and after walking exercise. This point may be deemed by some unworthy of notice; but it is one which we ought not to forget—that a slight inflammatory condition may manifest itself by local heat in the evening, after the exercise of the day, but, by the rest of a few hours during the night, it may almost disappear in the morning. In hip-joint disease the femur is slightly bent upon the abdomen, and somewhat adducted, and this occurs from the combined action of the flexors and adductors, which compels the thigh-bone to follow the mean direction of the two muscular forces. There is a constant law to which I have already alluded—that when a joint is inflamed, the movable part of it is obedient to the more powerful muscular action. If, then, you see a child

that limps a little in walking, the femur somewhat bent upon the abdomen, and the toe a little pointed, with inability to bear the whole weight of the body upon the limb, and when you make a little pressure over or upon the trochanter major, exeessive or moderate pain is felt, as eompared with the result of a like pressure upon the corresponding parts of the opposite side; if in assoeiation with these signs there be pain on pressure upon the front of the hip-joint, and pain in or near the hip-joint when the foot is struek upon its sole; and if, in addition to these local symptoms, there be a slight degree of febrile excitement towards night, a little restlessness during the night, with oecasional starting of the limb, the suspeeted limb being more flexed and more adducted during sleep (an almost eonstant oeeurrence), then, I say, you may be sure that these symptoms are indicative of something wrong in or near the hip-joint itself. It will be remembered that, at the early period of life to which I am now alluding, the bones forming the joint are composed of several parts (Fig. 64). The troehanter major is an epiphysis; so is the troehanter minor; so likewise the head of the femur is an epiphysis, having a separate eireulation, and joined to the neck of the femur by a temporary cartilage. This is no mere anatomical refinement, for I place before you a pathological specimen whieh will testify to the fact that the results of disease may be modified by the normal anatomy of that early period of life. We have here (Fig. 65) a drawing of a preparation from Guy's Museum, sent there by Dr. Holman, of Reigate. It is the epiphysis of the head of the thigh-bone separated from the neck of the femur of a girl fourteen years old. He discovered it lying in the upper part of the thigh, within the abscess associated with the hip-joint disease, and, by making a small incision through the soft parts, he was enabled to take it out. Dr. Holman informs me that this patient is dead, and that he had not the opportunity of examining the body.

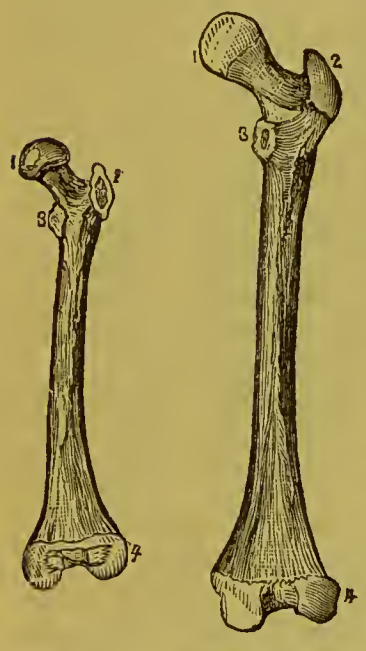


FIG. 64.—Sketches of young thigh-bones (copied from Quain's Anatomy), showing the epiphyses, or separable pieces of the bones. 1, Head of thigh-bone. 2, Trochanter major. 3, Trochanter minor. 4, Condyles. The head and the two trochanters unite with the shaft about the eighteenth year; the lower epiphysis remains distinct from the shaft till after the twentieth year.

Now, to revert to the symptoms of hip-joint disease. If a patient presents such local and general symptoms as those to which I have alluded, it is hardly worth while to go into the question as to what tissue is involved in the mischief. That, to my mind, is a pathological refinement which is of no advantage whatever in the treatment of the case. I think it is beyond the professional acumen of any man to be able to tell decidedly, at that period of childhood, whether the disease be between the neck of the bone and its epiphysis, the head, or whether it be in the ligamentum teres, or upon the surface of the head of the bone, or upon the floor of the aceta bulum, which at that period is divided into three segments, indicating the separate contributions of those three individual parts—the pubes, ischium, and ilium.

A little child, however, suffering from such so-called obseure or uncertain symptoms of hip disease, is likely to suffer from a misinterpretation of the symptoms, on the supposition that they may be caused by teething,

or perhaps rheumatism. These, I may say, are very common professional phantoms with the surgeon when considering such a case, so that all the attention is given to the innocent teeth and gums, which are scarified and punished unfairly for sins which do not belong to them, whilst the hip-joint symptoms are allowed to continue, or are left to themselves, to constitute what may be a fatal mistake. The other day I spoke to Mr. Thomas Bell as to what he had observed in his large experience on this matter, and his opinion coincided with my own views as to this misplaced association of teething and hip disease. He added, "I wish you would also intimate that a very great deal of mischief is often done to the evolution of teeth by scarifying the gums too deeply." It is obvious that it must be so. If the gums are scarified deeply, the rudimentary apparatus, which determines the development of the teeth, must be very much interfered with, either in their direction or integrity, by a reckless or badly directed incision into the gums.



FIG. 65.—Epiphysis of the head of the thigh-bone spontaneously detached. It presents two surfaces—one convex, the other concave. The convex articular surface is deprived of the whole of its articular cartilage, but the articular lamina of bone remaining gives it a smooth appearance. The concave surface is scabrous and uneven, having undergone partial absorption. There is no structural indication of scrofula in this piece of bone. *a*, Convex articular surface. *b*, Concave surface by which it was united to the neck of the thigh-bone through the medium of temporary cartilage, supported by a thin plate of bone, a small part of which remains, and is that on which the letter *b* is placed.

I should have no hesitation, in a case presenting the hip-joint symptoms to which I have referred, in expressing my conviction that the femur or acetabulum has suffered local injury in some of its epiphyses, or that the soft parts of the hip-joint itself are inflamed; and that the essential, and probably the only required remedy would be sufficient mechanical rest, secured to the patient by the recumbent position during several weeks. By persistent rest in such cases, you will surely anticipate the next series of more formidable symptoms which are said to be characteristic of hip-joint disease. In cases presenting these milder or less striking symptoms of hip-joint disease, I admit that it requires a strong determination on the part of the surgeon to say to the parents, "This child has disease about the hip-joint, or symptoms which lead to the suspicion that the hip-joint is diseased, and it is necessary that he should lie down for two or three months, with a splint upon the limb, to keep the joint quiet." But I know from experience that we may act upon it with great and not unmerited confidence. I feel strongly on this matter, because I am confident that if these early symptoms are properly made use of, and the surgeon will not wait for the next series (said to be the characteristic symptoms), which will be too conspicuous to everybody, he will not be troubled with long-continued cases of hip disease, nor will he meet with those old cases of deformed and displaced hip-joints as a result of disease, to which I have before alluded.

A widow lady once brought me her son, who was a candidate for admission to Christ's Hospital School. The lad presented these early symptoms of hip-joint disease: lameness, flexed thigh, slight local heat, and so on. His mother had been told that he might be lame for life, and therefore not eligible for admission, and she said, "I shall never be able to get him into the school if he has hip-joint disease; and I have come to ask your advice as to what I had better do with him, for he will soon be too old." I recommended that the boy should lie down uninterruptedly

for as long a period as his age would permit. The mother assured me that he should not get up from his couch for four months; at the expiration of that time he came to me perfectly well, cured by rest alone, and he was admitted into Christ's Hospital School.

Some years ago the proprietor of a hydropathic establishment came to me with a patient, and said, "I have brought you this young gentleman to examine. He is seventeen years of age, and has only recently entered my establishment. He consulted an hospital surgeon of eminence in London, who assured him that he had nothing important the matter with the hip-joint—that he was suffering from rheumatism or something of that kind, and advised him to take abundance of exercise. Acting on this advice, he is now suffering great pain, and is, as you see, very lame. His parents sent him to my establishment to be cured of his rheumatic hip-joint; but, finding that I am not doing the patient any material good by my treatment, I have thought it safer on the whole that he should see some one else." The patient, when he came into my room, was obviously suffering from acute disease of the hip-joint, and this was not long after he had been assured that he had nothing important the matter with it. This case shows that these serious mistakes do not belong to any one section of our profession. I did not see this patient again, but I know he was placed under good surgical advice and superintendence; it was however, too late, and he soon afterwards died.

The patient is less anxious than the surgeon respecting the precise pathological anatomy of his case, for it hardly signifies to the former whether the trochanter major is involved, or whether it is the head of the femur, or any portion of the union of the three bones which constitute the acetabulum at that period of life. Neither the patient nor his friends care anything about all this; the great object is, his freedom from pain and ultimate recovery.

But suppose that time should show that you are wrong in your opinion regarding the disease in an obscure case, rest during one, two, or even three months is not a very serious matter to the child. Assuredly, if you have given the proper advice, after the child has been lying down about a fortnight, many of those constitutional, and nearly all the local, disturbances which formed the early symptoms will have become much mitigated, and it will then be apparent that if you have not hit upon the precise pathological anatomy or the exact locality of the disease, you have discovered the right treatment of the case.

I am anxious to inculcate the importance of recognizing, or of diagnosing, a case of disease of the hip-joint or its neighborhood at a period before the full manifestation of those symptoms which are spoken of and traced in books as the characteristic symptoms of morbus coxarius. I must admit that it is still the opinion of some surgeons that inflammation or irritative disease of the hip-joint is sometimes associated with, or induced by, unhealthy teething. I cannot say that it is not so, but I think it must be a comparatively rare occurrence, for it certainly has not fallen to my lot to see more than one or two cases which could give any legitimate support to such an interpretation. On the other hand, I certainly have seen a great number of cases in which teething has been said to be the cause of hip-joint symptoms, where it has turned out to have had nothing to do with them, and a great deal of time has been lost, and the patient has been placed in danger by the delay.

Disease between the sacrum and the ilium may sometimes be mistaken for hip-joint disease. I have seen several cases of this kind, but another

occasion will be afforded me for bringing them before your notice. Only recently I saw a lady, a little way in the country, who was thought to have hip-joint disease on the right side. I examined the hip-joint, and there was certainly nothing wrong; it might be rolled about in every direction without pain; but on turning her over, and putting my finger on the space between the sacrum and the ilium on the same side, she exclaimed, "Now you give me a great deal of pain." I made equal pressure, and so did the other surgeon who was with me, upon the sacro-iliac joint at the corresponding part on the opposite side, but there were no indications of pain or tenderness.

I wish now to detail shortly the case of a patient who had incipient disease of the hip-joint, and who did remarkably well, in consequence, I believe, of the recognition of the early symptoms to which I have directed your attention. It was the case of a boy whom I saw in my private practice. While dealing with this subject of hip-joint disease, I find myself obliged to refer to cases in private practice, because we rarely see these early cases in the hospitals. In truth, such cases are scarcely ever seen in public institutions until the symptoms of hip-joint disease have become exceedingly conspicuous, and are advancing towards suppuration; and I am trying to rivet attention upon the state of the patient antecedent to such severe conditions, for no doubt can be entertained that the earlier the cases are rightly interpreted, the fairer is the chance of recovery for the patient.

Case of disease in the Shoulder-joint, the Joint not kept at Rest, and the Joint destroyed; Hip-joint Disease in the same Patient cured by "Rest."

This young gentleman was born in April, 1846. His mother was phthisical; she had cavities in one or both lungs when the child was born. In 1847 the child had inflammation or a diseased condition of the left shoulder-joint. The father took him to hospital surgeons who have now passed away, and who did not recognize this as simply an inflammatory condition, the probable effects of local injury, nor as a case to be cured by "rest." No, it was a scrofulous joint, and the shoulder was poulticed and the general health well attended to, as he had every possible advantage of good domestic care and change of air; but the arm, slightly supported by a handkerchief around his neck, was allowed to be used as a child would use it, without any positive restraint, except that suggested by pain. It ended in extensive suppuration, and in complete disorganization of the shoulder-joint. The child's health became very bad, and there was a fair prospect of his dying from suppuration. I saw him professionally in 1848, and he had then all the symptoms of incipient hip disease to which I have alluded, and Mr. Key, in consultation, confirmed this opinion as to the distinct existence of hip-joint disease. The prospect for the patient was not good. The mother was dying, and did die, of consumption; she had also hip-joint disease, with dislocation of the head of the femur, as the result of a very slight accident whilst travelling with her husband in North Wales. The child was very delicate and unhealthy-looking, with a thin, fine, silky skin. Suppuration was then proceeding abundantly from the shoulder-joint. In fact, his health was going on from bad to worse, and every local symptom in the shoulder-joint indicated a decidedly bad reparative power. But be it remembered, no credit at all had been awarded to Nature as regarded the shoulder; not a single chance had

been given to her to repair the injury; no useful kind of mechanical rest had been prescribed; and the disease had been allowed to take its own course.

When I saw the patient in 1848, he had disease of the left hip-joint. I had him placed upon a well-stuffed hair mattress, with a leathern splint upon his leg, thigh, and pelvis, like that depicted here (Fig. 66). I kept him lying there uninterruptedly for the space of six months,—from September, 1848, to March 29th, 1849,—with the left arm (the side diseased) fixed in a sling, but giving him permission to use the right as freely as he might wish, in order to amuse himself with his various playthings. The parents were constantly saying to me, "Let him get up; lying in bed will make him so weak, and his general health will suffer," and I as constantly replying, "No, no, his health is improving," and insisting upon the child remaining absolutely quiet for at least six months. The child was then allowed to get up, and to be carried about out of doors, but the splint was not taken off until the end of August, eleven months from the time it was first applied. At that time the whole of the hip-joint symptoms had entirely disappeared, the general health was good, and the shoulder was also greatly improved and approaching cure by anchylosis, yet discharging now and then little fragments of cancellated bone. The hip-joint was movable, painless, and would bear the weight of the body in standing without inconvenience; so that, in truth, in the same person, with the same constitution, the shoulder-joint had been destroyed and the hip-joint saved.

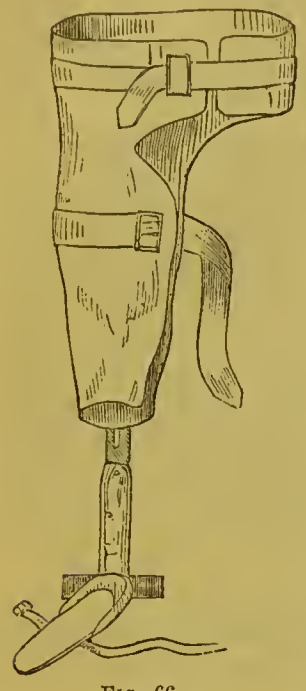


Fig. 66.

What was the cause of the difference in the actual condition of the two joints in this case? Just this, I apprehend. With the shoulder, Nature never had a chance of curing it by rest; and with the hip disease she had every opportunity offered to her, and she did not fail to make good use of it. The treatment adopted for one joint was ineffective, and that for the other quite successful. In 1850 the shoulder was still suppurating, still discharging a little thin pus and very minute portions of bone, and there was a large open ulcer at the posterior part of the joint. In 1854 I had a leathern splint placed upon his shoulder and upper arm, which he wore for two years, and at the expiration of that time the joint was perfectly well. I saw the patient early in June, 1858, and the hip-joint was then in a natural condition, and the left shoulder-joint completely anchylosed. The anchylosis and its remote effects manifested themselves in this way: the humerus and scapula were dwarfed and moved rigidly together, and, in addition to the rigidity of that joint, the clavicle was short, as compared with the other side, and the chest on the left or shoulder-disease side was not so much developed as on the other; hence the left lung and chest-wall were not in true concord as a part of the respiratory apparatus. The possibility in such cases of a want of harmonious and due proportionate growth of parts physiologically associated ought always to be borne in mind by the surgeon and the patient or his friends informed of it. Experience has taught me that it is an almost constant occurrence. The real importance of these remarks will appear when applied to the

result of long-continued hip-joint disease in the female. Thus I have ascertained by examination that the os innominatum on the side of the disease does not grow so rapidly, and finally is not so large as its fellow; hence the area of the pelvis is not symmetrical, and thus may interfere with parturition at the full period of gestation. I may add that this pelvic deformity is most conspicuous when the hip disease occurs in, or continues into, the period of early menstruation. Time will not allow me to dwell on the other details; but I must express my conviction that if the surgeon who first saw this child's shoulder had acted upon the idea that it was a diseased joint resulting from simple inflammation, the consequence probably of injury, and had given Nature credit for being very active in the reparative as well as in the formative process at that period of life, and had kept the shoulder perfectly quiet for some weeks, the shoulder-joint would have been saved as satisfactorily as the hip-joint.

To disencumber this case of its details, it is just this: Here was a child who had manifested by his shoulder-joint a scrofulous taint, if you like to call it so (although I am not a believer in scrofula to the extent that many people are), whose mother died scrofulous, and from pulmonary tubercular phthisis and hip disease; yet by giving this child's hip-joint rest for a long time, in spite of these constitutional and inherited difficulties, *he perfectly recovers* from this affection of the hip-joint, because it was recognized early enough to enable Nature to repair the injury which the child had sustained.

I may add that in February, 1861, I again saw this patient; he was then fifteen years of age. His general health was excellent; the formerly diseased shoulder-joint was fixed and healed up, and painless: the hip-joint is normal in every respect; and the boy had great mental abilities, combined with considerable energy. The left humerus was three inches shorter than the right; the left radius from half to three-quarters of an inch shorter than the right; and the left scapula nearly two inches shorter than the right, measuring from the acromion process to the inferior angle of the scapula. The left hand was smaller than the right, as shown in these ground-plans of the two hands. One of the most extraordinary peculiarities in this case was the remarkable development of all the muscles of the right arm; it had the aspect of the arm of a well-trained and most powerful prize-

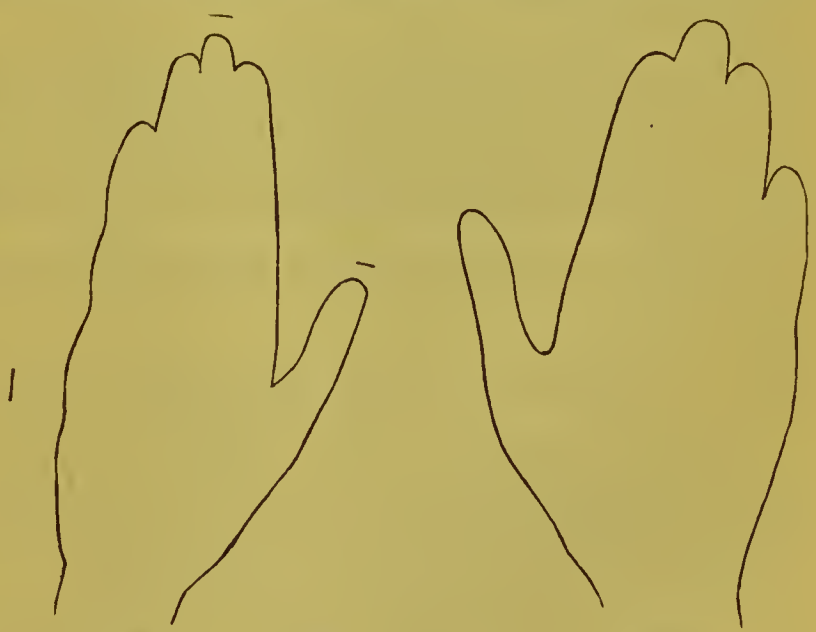


FIG. 67.—On comparing these two figures, it is obvious that if the shoulder disease had been on the right side, and the same undeveloped condition had supervened, the value of this patient's prospects in after life might, from his inefficient right hand, have been much impaired.

fighter. I could not have conceived it possible that the muscles of a boy of fifteen could have acquired such large dimensions and such beautiful development.

Case of Diseased Hip-joint cured by Five Months' Rest.

In 1847 I attended a young gentleman in London, aged seventeen, with severe disease of the hip-joint. He was pale, unhealthy-looking, and flabby; he had enlarged tonsils, and a thick husky voice. The hip-joint disease was the consequence of fatigue from a long walk. His mother, four sisters, and two brothers had died of pulmonary consumption; so that his prospects, constitutionally speaking, did not appear to be very favorable to a cure. Sir Benjamin Brodie saw him in consultation with myself in 1847, soon after the symptoms commenced, and we both agreed that he had some serious disease of the hip-joint. I had previously applied a leathern splint or case to his limb and pelvis (Fig. 66); and he was compelled to maintain the recumbent position, with the splint on, and his hip-joint in a state of entire rest, during five months. After that time he gradually resumed his walking exercise, and has been perfectly well ever since. Here was a case which, judging by the antecedents of the patient, by his actual bad health, and looking at what had occurred to his mother, brothers, and sisters, seemed to present an unfavorable prospect; but this young gentleman was in India for three and a half or four years, in very active occupation, during the late rebellion, and is now perfectly well. He can move his joint freely, and can walk seven or eight miles without any difficulty. He is rather thinner than formerly, but is apparently quite well.

I shall endeavor to show you that notwithstanding that disease of the hip-joint may have advanced to a period when the symptons of hip disease are conspicuously distinct, though the constitution may be very bad, and the soft parts of the joint destroyed, patients may still get perfectly well by rest with an anchylosed hip-joint. This would at once appear to negative the idea of a scrofulous condition of the bones necessarily existing in such cases.

The notes of the next case to which I shall allude are taken from my private practice.

Case of Hip-joint Disease of One Year's Duration cured in Seven Months by Rest.

In January, 1855, the patient (a little girl between four and five years old) lame, and in great pain, was taken to a surgeon, who pronounced that she had hip-joint disease, and that he regarded it as scrofulous. She was under his professional care about eight months. He directed her to be taken to the sea-side, to have medicine, and to move about or take exercise, that her general health might be improved, thus hoping to cure the case by invigorating the constitution, but no direct rest was given to the hip-joint. The local and general disturbance and distress increased so as to become excessively severe. In December, 1855, eleven or twelve months after the appearance of the first symptoms, she was brought to my house. She could not bear the pain of being very gently and carefully carried in the arms of her mother. The child was much wasted, and a picture of really extreme bodily distress, screaming with pain nearly all the time she was with me; and her mother informed me that she had had scarcely any sleep during many weeks from the pain in the hip and the

outer side of the knee, these pains being especially severe at night. The thigh was flexed upon the abdomen, abducted, and the knee turned inwards, evincing a disposition of the head of the femur to be dislocated backwards; there were also fulness and rotundity at the back of the joint. The slightest pressure upon the trochanter major or upon the sole of the foot, for the purpose or forcing the head of the femur into the acetabulum, caused great agony. There was a marked disposition of the head of the bone to be displaced backwards (always a serious complication), and the distinct fluctuation of an abscess below Poupart's ligament to the outer side of the hip-joint. The patient was taken home with great care, and by my direction Mr. H. Bigg went to the house the same evening, and moulded this leathern splint (see Fig. 66), or case, upon the pelvis and upon the hip, with an extension to the foot for the purpose of keeping the hip-joint and the whole leg at rest. Great pain and distress were experienced by the patient whilst the limb was being straightened, but there was no alternative, and it was done. In adapting a splint to a case of hip-joint disease, it is important not only to prevent any movement of the joint, but also to insure easy, persistent contact between the articular surfaces without pressure, so as to facilitate bony union, supposing the soft parts to be destroyed; or if the soft parts be simply inflamed and swollen, then to prevent undue pressure (the result of unconstrained muscular force) of the soft parts, mutually inflamed, upon each other. Another object in this case was to prevent rotation of the limb either inwards or outwards, because it is obvious that *if no such rotation be permitted, no dislocation can occur.* All the requirements were carried out in this patient by the splint. It was accurately adapted, and answered remarkably well. You will observe that a sliding footpiece is attached, so as not to interfere with the growth or elongation of the limb. Children grow very rapidly, especially so if well fed, when in the recumbent and supine position, and if the footpiece of the splint be fixed, there will be a constant contention, if we may so term it, between the restraint on the part of the splint and the changes incident to growth. The footpiece must therefore be allowed to elongate itself as the child grows. The splint is also provided with a transverse portion under the footpiece, which prevents the possibility of any rotation either inwards or outwards. The patient was placed on her back upon a well-stuffed hair-mattress bed, and this splint was kept on uninterruptedly, or nearly so, during seven months. It was taken off three or four times by myself with care, merely for the purpose of examining the progress of the cure, and of facilitating personal cleanliness. During the latter portion of the time she was taken out of doors, with the leathern case or splint on, and lying horizontally upon a little wheeled carriage with easy springs. The medical treatment consisted simply of opium, in large doses at first, to secure sleep, and one-sixteenth of a grain of bichloride of mercury twice a day, with sarsaparilla, during about a couple of months. No seton, no issue, no tartar-emetic ointment, no croton-oil liniments, nothing of the kind was used. The general health and appetite improved rapidly after the first month of confinement to bed. At the expiration of the seven months, all pain, tenderness, and constitutional disturbance having disappeared, she was allowed to take gentle and well-watched walking exercise, without harm. The abscess in the thigh gradually subsided, and was finally absorbed. I saw the patient again about sixteen or eighteen months from the time she began to take independent exercise. She walked into my room quite comfortably, well in health, but rather flat-footed. She could then walk

two miles without any difficulty or pain. The muscles of the thigh and leg were increasing in size almost weekly. There was a slight limp in the walk, the foot very little everted, and there was, perhaps, from about a quarter to half an inch shortening of that limb, as compared with the other; there was no abscess to be felt, no fluctuation to be detected anywhere, and the bony anchylosis was perfect. For the purpose of testing this latter point of bony union, I placed the child recumbent upon a couch, and pressing downwards upon the pelvis, endeavored to flex the thigh-bone upon the pelvis, but I could not carry the thigh-bone towards the abdomen without lifting the pelvis at the same time; the other lower limb was perfectly natural in all its movements. I might suggest that the slight shortness of the diseased limb was due to the arrest of growth on that side while the other side was growing, this defect in development as to the length of the limb being a constant result of hip disease. This case proves, then, that although hip-joint disease may have existed uncontrolled during nearly a twelvemonth, yet it is perfectly curable, with a stiff joint, by rest alone, which may be styled the best possible result in such a condition of joint. The case, I think, shows also that there was no scrofulous condition, no tuberculous state of bones, for I cannot believe that if those bones had been scrofulous, we should have obtained such a rapid and perfect anchylosis, or bony union.

I now come to another case of hip-joint disease, of which I have the post-mortem results. The patient had been partly in the hospital, and partly a private patient; and the case shows that, notwithstanding a tubercular constitution, yet by rest and proper treatment, persons with severe hip-joint disease may do well.

Case of Hip Disease occurring in a Scrofulous Patient; the Hip Disease cured by Rest.

A. R—— was thirteen years and a half old when he died, in Oct., 1857. He began to be lame in 1855. There was no known accident. He had pain in the upper part of the thigh, but no pain in the knee or hip, so far as he or his parents remembered. He was taken to an hospital surgeon, who believed the pain to be rheumatic. The patient was ordered to employ walking exercise every day, and to take tonics, and he was sent to the sea-side to improve his general health; but the local disease was not at all diminished, and he was, by particular request, admitted into Guy's Hospital, under a physician, in July, 1856. He was then thought to be rheumatic, and was treated for rheumatism. He remained for six weeks without the slightest benefit. He was brought to my house in October, 1856, fifteen months after the joint disease had commenced, clearly suffering from hip-joint disease, and presenting a very tubercular and scrofulous appearance. There were all the symptoms of hip-joint disease resembling those of the little girl whose case I have just mentioned. There was pain in and about the hip-joint, great tenderness, great fulness, evident suppuration, and a constant tendency to dislocation of the thigh-bone backwards. The foot was being turned inwards by the muscles, which were in a state of spasm, the spasmodic jerking of the limb occurring most violently just as the patient was going off to sleep. I may observe that this is the time when dislocation most frequently occurs. There was every indication, in fact, of dislocation taking place from this cause, if means were not employed to prevent it. The fluctuation of an abscess was obvious at the upper and outer side of the thigh, and the

glands of the groin were enlarged. His nights, his mother said, were "horrible;" he suffered much pain, had no appetite, and was exceedingly feverish. The leathern splint (Fig. 68) was placed upon the patient, and, as there was an abscess of considerable size then forming, it was necessary to make an aperture in the splint to allow of some local application, and to enable me subsequently, if necessary or advisable, to open the abscess without disturbing the hip-joint. The patient died about a year afterwards of chronic tubercular peritonitis; he had also some tubercles and cavities at the apices of both lungs. In this case we find both in the peritoneum and in the lungs the pathological evidences of the tubercular diathesis, or (if tubercle is to be the histological basis of scrofula) of the true scrofulous constitution. Notwithstanding all this, by keeping the patient's hip-joint



Fig. 68.



Fig. 69.—This drawing represents a continuous vertical section of the os innominatum, acetabulum, and thigh-bone of this patient, aged thirteen and a half. *a*, Os innominatum. *b*, Neck of thigh-bone. *c*, Epiphysis of head of bone united to the upper part of the acetabulum. *d*, Epiphysis of trochanter major.

perfectly quiet, we not only prevented dislocation, but allowed Nature to produce bony anchylosis of the hip-joint. If ever there was a local condition which seemed to defy the probability of anchylosis of the hip-joint, it was in this case; or if ever there was a constitutional state the very opposite of that which would suggest anything like a prospect of good repair, this was such an instance. But here (Fig. 69) is represented the hip-joint itself of this patient; the bones are not perfectly consolidated, it is true, although they are very nearly so. I have placed before you a faithful sketch, and you observe that the head of the femur is firmly joined to the floor of the acetabulum. In fact, so complete and so strong was the medium of union between the two bones that he had walked out of doors

several times without the splint, and could bear his weight upon the limb without pain.

Here, then, was a scrofulous constitution, but there is no evidence of tubercular deposit in the bones, and the repair is good. This case is also very encouraging to the pursuance of a persevering plan of treatment by "rest." The medical treatment of the case was very simple. Whilst the boy was suffering from a febrile condition, he took the ordinary fever medicines, and subsequently we gave him for a short time a small quantity of bichloride of mercury with sarsaparilla, and after that cod-liver oil and steel wine, securing at the same time rest to the hip-joint. *Absorption of the abscess was proceeding in this case.* The remains of the abscess were found in the form of a small quantity of sero-purulent fluid and a layer of semi-solid deposit upon the floor of the contracted abscess-cavity. This cavity communicated, by a very narrow, tortuous canal, scarcely larger than a probe, with the parts surrounding the joint, but we could not detect its exact termination.

Several of the cases of hip disease which I have related occurred some time ago, and I selected them for the purpose of showing that they did well, and have since done well, the patients being alive and in good health, with the exception of the one whose anchylosed hip-joint I have placed before you. I will now direct your attention to three other cases of hip-joint disease formerly under my care in the hospital, and from which sketches were taken. I think you will perceive they give some important evidence of the value of rest in the treatment of such cases.

Diseased Hip-joint; Limb much bent; straightened under the influence of Chloroform; Splint applied; cured by Rest.

The first case is that of a little girl aged seven. She was admitted into the hospital under my care in June, 1860, with rather acute disease of the left hip-joint, and in very bad health. Three years ago she fell down-stairs, and was supposed to have hurt her hip; she had been more or less lame and in pain ever since. By irregular rest and quiet, and getting about upon crutches, she was, after some time, recovering, when she was knocked down by accident. This was followed by pain in the hip. She then became an out-patient at St. Thomas's Hospital during three months, and at Guy's during nine months, without any benefit. When admitted into Guy's, in June, 1860, she had all the indications, local and general, of severe hip-joint disease, with deep suppuration in the anterior, upper, and outer part of the thigh. The limb was flexed and adducted; the patient was suffering great pain in the hip, had little sleep at night, and little or no appetite. Chloroform was administered, and the contracted muscles of the joint yielded steadily and nicely to carefully applied extension. The flexed limb was made straight, and a long common iron splint (Fig. 70) applied along its outer side, extending from near the axilla to the foot, with a transverse bar to prevent rotation; the recumbent and supine positions to be strictly maintained. Immediately after the application of

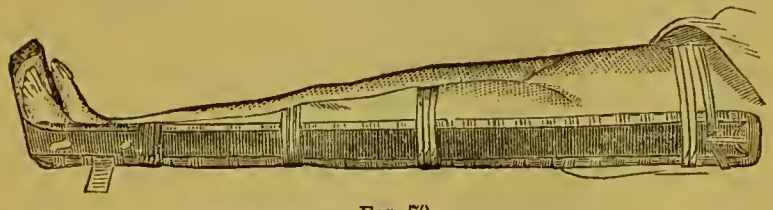


Fig. 70.

the splint, all the disturbing symptoms began to disappear, and her appetite returned. So free from suffering did the patient continue, and so efficacious was the splint, that I did not disturb it for five months, that is, till November, 1860, and then the joint was found to be fixed or anchylosed to the acetabulum, and the experimental movements did not produce much pain. The patient was ordered to continue the splint. In Feb., 1861, there was not a single untoward symptom; the health was good. The splint having been removed, the bony anchylosis was firm, and the lower extremities were of nearly the same length. She had no pain when direct pressure was made on the hip-joint below Poupart's ligament, nor when the sole of the foot was struck. This sketch (Fig. 71) was made on June 6th, 1861. The child was quite well, except that an



FIG. 71.



FIG. 72.

FIG. 71.—Severe disease of the left hip-joint, terminating in bony anchylosis, with the limb in a good and useful position; cured by mechanical rest.

FIG. 72.—This sketch shows the patient's actual condition. The limb is in good position, and the child free from pain.

abscess was still there, which was not to be opened under any circumstances for a considerable length of time, in the hope that it would be absorbed. The child went out on the 16th of June, 1861, since which time I have not seen her.

The other two cases are more remarkable. They are specimens of hip-joint disease, cured, as far as possible, by rest. In both cases dislocation outwards and backwards on to the dorsum of the ilium occurred from disease, and in both the dislocations were reduced, and the bones have since remained in their proper positions.

Dislocation on Dorsum Ilii of left Femur from Disease; Dislocation reduced; Anchylosis proceeding.

C. B——, aged five. No accident or local injury was known to have happened to the child, who was previously in good health. He com-

plained of pain in the knee six months before he began to be lame. He was under the care of Mr. Stormont, of Cheshunt, eighteen months ago. He used to lie in bed for a week or ten days; then get up, and soon became lame again, taking alternate rest and exercise, but on the whole steadily getting worse until December, 1860, when he could not get up, since which he has been constantly in bed, lying on his right side. Dislocation of the thigh-bone must have occurred when in bed. The left leg was drawn up. He suffered great pain in the knee and hip. The general health was very bad, and he could scarcely bear being moved by the nurse. This patient was in an hospital in London during the months of April and May, 1860. He had an issue made over the hip-joint when in that institution without any benefit; no splints were applied; he was more lame when he came out than when he went in; and he was represented as incurable. He came under my care on the 23d of January, 1861. He had then a dislocation of the left femur on to the dorsum of the ilium. The dislocation was reduced three weeks after admission, under the influence of chloroform. The pelvis and lower limb were then carefully (and not too tightly) bandaged to a straight wooden splint placed on the outer side of the limb. The splint had a transverse foot-piece fixed to it in order to prevent any rotation of the hip-joint. There was scarcely any pain in the knee or hip-joint after that time. His health appeared perfectly good, and the limb was in an excellent position. There was no pain, but simply an abscess upon the anterior and inner part of the thigh, which was left alone. Bony union had taken place between the head of the femur and the acetabulum.

This appears to be a good case in reference to the influence of rest in the treatment of diseased hip-joint.

Dislocation of Thigh-bone upon the Dorsum Ilii from Disease; Dislocation twice reduced; Anchylosis in good position.

The third case is a much more curious one. Mr. Stanley, who happened to be at Guy's Hospital in the summer of 1859, saw this little patient. M. P——, aged seven, was admitted into Charity ward on March 2d, 1859, under my care. Her mother stated that she had always been a very delicate child. In November, 1858, she first complained of pain in the left knee, and was noticed to walk lamely; her health also began to be seriously damaged. The mother took her as an out-patient to a London hospital, where numerous blisters were applied without apparent benefit. The recumbent position was subsequently in part maintained, while occasional blisters over the hip were prescribed. This plan was persevered in, but so severe was the pain experienced in moving, that it was not possible for her to continue her attendance as an out-patient. About a fortnight before her admission into Guy's Hospital, the deformity which is peculiar to the dislocation of the thigh-bone on the dorsum of the ilium first distinctly appeared; it occurred at night, accompanied by great aggravation of the patient's symptoms. This led her friends to seek admission for her into Guy's. The report on admission states that she was a feeble, strumous-looking child, with delicate skin, long eyelashes, and somewhat prominent lips. She had lost her appetite, and was suffering a great deal of pain in the hip, especially at night. She was very restless, and the left leg was much shorter than the other. The thigh was flexed and adducted, the knee bent, the foot turned inwards, resembling the dislocation of the head of the femur upon the dorsum ilii;

in fact, the head of the bone could be felt lying upon the ilium behind the acetabulum when the leg was rotated inwards. A fortnight after admission she was placed under the influence of chloroform, and the limb forcibly extended or drawn downwards to the level of the acetabulum, and then rotated outwards; and so the head of the femur was brought into contact with the acetabulum. The deformity having been thus removed, and the dislocation reduced, a long iron splint was applied to the outer side of the limb and pelvis to give rest to the hip-joint. The child was afterwards restless and irritable, and in a day or two succeeded in so loosening the bandages and splints, that the femur became again dislocated backwards, with its head upon the dorsum ilii. On April 30th, 1860, ten weeks after the first occurrence of dislocation, she was again placed under the influence of chloroform, and the dislocation once more reduced. A long straight splint was again applied to the limb and pelvis, and short splints put upon her hands, to prevent her meddling with the bandages. This manœuvre succeeded, and in a few days the hand splints were taken off, as she found the long splint to the leg and pelvis so comfortable, and she was herself so free from pain, that she did not wish to interfere with it. From that time she went on improving rapidly; she became better in health and plumper than she ever was before. In the summer of 1859, during the warm weather, she was carried into the park or garden at Guy's. She slept and ate well, and made no complaint of pain. The splint was replaced and readjusted at intervals, care being taken not to disturb the joint. October, 1859: The patient was examined. The diseased limb seemed rather longer than the sound one; the symmetry of the two hip-joints was nearly perfect; the femur could only be slightly flexed upon the pelvis. There was still slight tenderness on pressure on the trochanter major and the head of the femur, the anchylosis being not yet completed. On March 26th, 1860, the report states: Anchylosis is perfect; at least the pelvis moves firmly with the femur without pain: the patient can bear some weight upon the left limb, and can walk a few steps with a little support. There is no tenderness on pressure upon the head of the femur or the trochanter major. About five inches below Poupart's ligament an abscess can be detected. The splint to be reapplied. This I looked upon as a pet kind of case. I have a photograph (Fig. 73) of the condition of the patient as she stood before the artist. Mr. Furner, one of the surgeons of the Brighton Hospital, obliged me by taking her under his care, and she was for three months at the sea-side, where she was in capital health, free from pain, and could walk a little about the hospital ward. At the expiration of the three months her parents brought her to town by an excursion train; the splint had been taken off, and in the large and careless crowd at the London terminus the child was so pushed and squeezed that the limb was forcibly turned backwards upon the pelvis, materially damaging the newly united structures at the hip-joint. She was taken home



Fig. 73.—This sketch represents the actual position of this little patient's limbs, the splint being removed to enable the artist to complete his representation of their outline. The dark spot seen upon the anterior part of the thigh indicates the opening communicating with the abscess, which still discharges a small quantity of purulent fluid.

screaming with pain, and soon afterwards suppuration occurred near the hip. The discharge depressed her health extensively, so that when I discovered her home near Stepney I found her greatly emaciated, badly fed, and badly nursed; no splint upon the limb, and a profuse discharge from the abscess. She was admitted into Guy's Hospital under my care, with the second injury to the hip-joint. Her health gradually improved; the discharge diminished, and ossific consolidation again took place in the hip-joint. This case was finally cured, and remained so up to the last occasion on which I saw her, some years after the date of her leaving the hospital.

In discussing the question of the influence of Rest in the treatment of disease generally, I thought I might, more especially by pointing out its application to the diseases of the joints, induce in the minds of some of our professional brethren a more philosophic consideration of the pathology and treatment of a class of cases which are not unfrequently abandoned to the care of the empiric and the mindless.

By regarding this subject of physiological and mechanical Rest in what I conceive to be its proper professional light, the surgeon will be compelled to admit that he has *no power to repair directly* any injury. It will induce him to acknowledge, in all humility, that it is the prerogative of Nature alone to repair the waste of any structure. He will thus realize that his chief duty consists in ascertaining and removing those impediments which obstruct the reparative process or thwart the efforts of Nature, and thus enable her to restore the parts to their normal condition.

LECTURE XV.

Dislocation of Right Femur; Reduced Two Months afterwards; Death from Pyæmia —Hip Disease supposed to be Scrofulous cured by Anchylosis after Rest; No Distinct Abscess—Hip Disease in a Phthisical Patieut cured by Anchylosis; Abscess absorbed—Discussion of the Propriety of opening Abscesses connected with Diseased Joints—Hip Disease; Bouy Anchylosis; Opening of Abscess deferred; Recovery—Chronic Abscess absorbed—Abscess in Dorsal Region absorbed—Disease of Hip-joint; Auchylosis and Large Abscess absorbed—Diseased Hip-joint, with Suppuration of the Left Side cured by Four Months' Rest; Abscess absorbed —Diseased Hip-joint, supposed to be Gonorrhœal; Abscess opeued by Nature; Portions of Bone extruded by Granulations; Cured by Rest, with Permanent Anchylosis.

From the unfinished state in which I left the subject of "hip-joint disease" in my last lecture, I feel bound to give some further evidence in support of my assertion, that hip-joint diseases are not so commonly scrofulous as has been assumed, or, if scrofulous, are yet curable by "rest."

I am well aware that my assertion, that diseased hip-joints are not as a rule so generally associated with scrofula as is commonly supposed, must be well demonstrated by facts before I can make an impression on the thinking and reflecting portion of our profession. I must be prepared to show, by a series of undeniable cases, that diseased joints, whether scrofulous or not, will yield to the treatment by mechanical rest, before I can induce my brethren to follow my plans in their daily practice. I now proceed to lay before you some additional facts and cases in support and corroboration of the views I have long entertained on this subject.

At the conclusion of my last lecture I mentioned two cases of hip-joint disease, in each of which dislocation of the thigh-bone had occurred from disease, and in each was subsequently reduced.* At that time one of the cases had been doing remarkably well up to the period of an accident which led to a severe injury of the new medium of bony union (anchylosis) between the femur and acetabulum. That child remained some months after her readmission into the hospital, and was finally cured. I have lost sight of her for some years. The other patient also left the hospital, going on most satisfactorily, and wearing a leathern splint. Here is a short report (March 11th, 1862) of the actual condition of the latter patient from Mr. Stormont, of Cheshunt: "I saw the hip-joint case yesterday. His general health is very good; the limb preserves its position and its length, and there is no pain at the hip-joint on pressure. The splint has not been taken off since his return home."

I refer to these cases because they are very striking, and will possibly

* In the form of an appendix will be found an extremely interesting case of hip-joint disease formerly under the care of Mr. Hilton: in this case one femur was displaced on to the dorsum ilii, the other into the neighborhood of the foramen ovale.—[Ed.]

establish a precedent to justify the repetition of such attempts at reduction.

I now bring forward a third case bearing on this subject. The accompanying drawing (Fig. 74) represents a section of the epiphysis of the femur and acetabulum, taken from the patient to whom I am now about to refer.

Dislocation of right Femur from Disease of the Hip-joint; Reduction of the Dislocation Two Months afterwards; Death from Pyæmia.

The patient, S. R——, aged twenty-two, was admitted into Guy's Hospital, under my care, on the 31st of October, 1861. Her history was this:—

Four months ago she was taken ill, without any known cause, with pains down the right leg and thigh, which confined her to bed. She remained in bed some time, her leg being then nearly straight. She was suffering great pain in the hip, with inability to move the limb. She had been treated for various local diseases by different medical men, and latterly, up to the time of her coming to Guy's, most assiduously, by a homœopathic physician, for "rheumatic sciatica." Two months before admission, one evening, soon after falling asleep, the thigh became somewhat suddenly bent, and the foot inverted. From that time she was unable to straighten the limb. She then had increased pain in the right groin and right knee.



FIG. 74.—This drawing (from the preparation) represents a vertical section of the right os innominatum through the acetabulum and its associated thigh-bone. *a*, Os innominatum. *b*, Epiphysis of head of femur, partially united by good bone to the acetabulum above, and below to, *c*, the neck of the thigh-bone, which has glided a little inwards beyond the epiphysis; nevertheless, bony consolidation was proceeding.

Here I think it worthy of a passing consideration to inquire why it is that these dislocations from disease almost always occur just as the patient is falling off to sleep. It is *then* that volition has withdrawn its influence from the nervous system generally, and the excito-motor function of the spinal cord seems to obtain an exclusive authority over the limbs, and produces the involuntary spasmodic condition of the muscles which causes these displacements. Whether this be the true interpretation or not, you will find, upon referring to the history of these cases, that such displacements almost always occur just as the patients are going off to sleep.

This patient came under my care on the 31st of October. On the following day I found her lying in bed, on her left side, suffering much pain in the right hip, thigh, and leg, which was increased on attempting to move the limb. The position of the limb corresponded exactly in direction with that usually occupied by the head of the thigh-bone when dislocated on to the dorsum of the ilium; and this, she assured me, had been her condition for two months previous to her admission. I state this with confidence, for she

asserted most positively that the bone had been in that position certainly for two months. The thigh was flexed and turned inwards, knee and foot inverted, and the limb shorter than that on the other side. Pressure upon the trochanter major caused great pain. She had a large, unhealty bed-sore over the sacrum. As no careful examination of the limb could be made without inducing extreme pain and distress to the patient, chloroform was administered. On forcibly inverting the right leg, the head of the thigh-bone could be distinctly felt under the muscles upon the dorsum of the ilium. All the other usual local symptoms of dislocation on to the dorsum ilii were present. A powerful and steadily continued effort to reduce the dislocation by simple extension and counter-extension was ineffectually made. I then grasped the thigh, and flexed it several times towards the abdomen, so as to give more freedom to the mobility of the displaced head and neck of the bone; the thigh was next forcibly abducted, and then rotated outwards, in order to lift it from its abnormal position, and to tilt the head of the bone over the edge of the acetabulum. This being accomplished, the thigh was drawn downwards and inwards, the whole limb everted, and the head of the bone passed into the acetabulum, where it could be felt below Poupart's ligament on rotating the limb slightly outwards. The position of the limb had become in every respect normal. I mention these facts, because they afford direct evidence that the dislocation was actually reduced, and reduced two months after the occurrence of the dislocation. She was placed upon her back, a long straight splint, with a footpiece and transverse support, was applied along the outer side of the lower limb and pelvis, and simply bandaged to them, so as to prevent rotation of the limb, and any recurrence of the dislocation. In three or four days, although she had been suffering for as many months, all the untoward symptoms of this case had subsided. This improvement was simply and entirely the result of the rest which had been given to the hip-joint by readjusting the two bones forming it in their proper relation to each other. She slept well, was free from pain and febrile condition, the swelling of the thigh had nearly disappeared, and her appetite was good; indeed, she felt better than for the four previous months, complaining only of the bed-sore. She was absolutely quite comfortable, excepting the annoyance of the bed-sore, and improving daily in appearance and strength up to the 12th of December, when she had an intense shivering, followed by fever, headache, and sickness; no pain in the limb or hip-joint, the pulse very rapid, and her appetite gone. She was, in fact, the subject of pyæmia. These symptoms continued, and developed into pneumonia, which proved fatal in nine days. She died on the 21st of December, forty-four days after the reduction of the dislocation. The right limb, by accurate measurement, was found to be rather more than half an inch shorter than the left. The body was examined on the following day, and the whole of the right lung was found pneumonic, with numerous, well-defined, small collections of pus in different parts of it. There was no disease in any other viscus; but I may add that the bed-sore had reached the interior of the vertebral canal, and involved the membranes of the spinal marrow, which extend downwards as far as the second portion of the sacrum, although the marrow itself ceases opposite the second lumbar vertebra. I have several times seen fatal mischief result from a bed-sore extending to the interior of the vertebral canal, and causing inflammation of the spinal cord and its membranes.

Fig. 75 is an accurate drawing made by Mr. Tupper from a preparation illustrating this important pathological condition.

Reeurring to the case we have been eonsidering, you will observe evidenee (and it is well worthy of note) that at the age of twenty-two the head of the femur may be still in part an epiphysis. Looking at the whole preparation (Fig. 74) pathologically, it will be seen that reparation had been proeeeding in the joint very satisfactorily indeed; and I think we may fairly eonelude that, if the patient had not been the subject of fatal pyæmia, this would have been a good case to exemplify the great advantage likely to aeerue from the reduetion of a femur dislocated by disease.



Fig. 75.—The accompanying sketch (taken from an anatomical preparation long ago made by myself) is introduced to remind the surgeon of the close proximity of the sheath of the spinal marrow and the posterior wall of the sacral portion of the vertebral canal. *a*, *a*, *a*, Vertical section of third, fourth, and fifth lumbar vertebræ. *b*, *b*, Vertical section of the sacrum. *d*, Portion of the arch of the sacrum reflected backwards. *e*, *e*, Short delicate elastic ligaments are seen proceeding from the lower part of the spinal dura mater to the sacrum. *c*, Dura mater, containing cauda equina, arachnoid and cerebro-spinal membranes, reaching a point opposite the second bone of the sacrum. Numerous strong ligaments are seen affixing the dura mater to the posterior ligament of the spine and sacrum opposite the second portion of the sacrum. Three distinct slender ligaments proceed to the third, fourth, and fifth portions of the sacrum.

The question oeeurred to my mind, on seeing the bony union of the edge of the aeetabulum to a portion of the head of the femur, whether the true epiphysis had been displaced from the aeetabulum at the time of the disloeation; whether it was not the projecting portion formed by the neek of the bone whieh I felt upon the dorsum of the ilium previous to the reduetion of the disloeation. If so, it would render the ease still more interesting, because it would show that, notwithstanding that both the upper and under surfaees of the epiphysis of the bone was diseased, reparation was in progress, and that, as far as the hip was eoneerned, it may be deemed a sueeessful ease. I thought this instanee would be a good appendix to the two analogous cases whieh I had the pleasure of detailing in my last leeture.

Eneouraged by these eases, I hope surgeons may be indueed to try to diminish to some extent, if not to eompletely remove, that extreme deformity whieh they so often meet with in cases of hip-joint disease with disloeation of the thigh-bone, provided they see them before Nature has formed a substituted joint or a eonsolidated ossific union between the ilium and the thigh-bone in an abnormal position. I know it has fallen to the lot of my eolleague, Mr. Coek, as well as to myself, to treat sueh eases with great advantage to the patients. Thus, when the head of the thigh-bone has been displaeed high up on the dorsum of the ilium, produeing great deformity, pain, and eonstitutional distress, although it may not have been in his power or mine to replaee the head of the bone aetually within the aeetabulum, yet we have sueeeeded, in some instanees, in mitigating the deformity, in relieving mueh of the pain and constitutional distress, and in restoring the limb to nearly its proper length.

Hip Disease, Scrofulous (?), treated by "Rest;" cured by Anchylosis; no distinct Abscess.

The next ease to which I must allude is that of a girl who was said to have serofulous disease of the hip-joint.

Elizabeth L——, aged nine years, eame under my eare at Guy's on

February 13th, 1861. The mother stated that fifteen months before that time the child fell on the pavement, and struck her right hip, but after a day or two did not complain of any inconvenience. (It is worthy of notice that if we inquire of the parents or other intelligent person old enough and willing to tell the whole truth, it will nearly always turn out that patients suffering from hip disease have met with accidents. Without exaggeration, I believe we may almost always associate accident with the origin of hip-joint disease. I am quite aware that it is sometimes very difficult to ascertain the exact account from a child, especially when it has been under the care of a servant; but I feel confident that most of the hip-joint diseases in children depend on small accidents.) About a month after this occurrence she spoke of having pain in her right knee, and was lame. These symptoms continued to increase, until she was compelled to use crutches. She attended at an infirmary for two months as an out-patient, and liniments were applied without any relief. She then became an out-patient at University College Hospital during four months; had blisters applied over the hip, and took cod-liver oil; but she got gradually worse. Her mother then kept her at home for eight months, when the pain in the knee, with loss of sleep and health, became so severe, that she applied at Guy's for admission. On examination, she had all the local symptoms of advanced disease of the right hip-joint: the foot was turned inwards, and the thigh bent, with tendency to dislocation of the head of the thigh-bone on to the dorsum of the ilium. By accurate measurement, the limb on the diseased side was three-quarters of an inch shorter than the opposite one. Much pain was experienced on moving the right hip-joint; some fulness (but no distinct fluctuation) existed over the front and back of the joint. Chloroform was administered, the limb carefully and slowly straightened, and an ordinary straight wooden splint with a foot-piece applied along the outer side of the limb and trunk from the foot to near the axilla. She had a firm, unyielding mattress to lie upon; no medicine was ordered, but good food freely supplied.

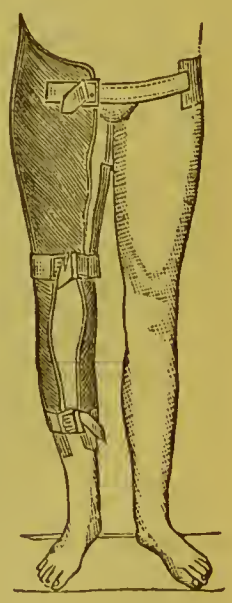


Fig. 76.

Now here was a young girl who for eleven months previously to her admission into Guy's Hospital had had disease in the right hip-joint. Those who had seen her during that time had no doubt about it. At the time of admission hip-joint disease was unequivocally manifested, and her general health was declining. The wooden splint was put on simply for the purpose of insuring rest to the diseased joint, and it remained on for five months. At the end of that time, on July 5th, 1861, the clinical report states: "Up to this time the splint has been removed only once, as she has been in every respect comfortable; scarcely any tenderness on pressure over the front of the hip-joint, nor is any induced by pressing upon the trochanter major or by striking the heel; both legs are apparently the same in length; the fulness has disappeared; no evidence of suppuration; the joint is becoming firm. Splint to be reapplied, and rest continued." Then she is not examined again for three months more; nothing is done but to feed her well and to keep her lying in bed. On October 15th, 1861, after eight months of rest, we find that the tenderness over the head of the thigh-bone is entirely gone; the femur is united to the acetabulum; the thigh and pelvis may be moved together

freely without pain; the right limb is about half an inch shorter than the left; she can bear her whole weight upon the right leg—that is, the diseased one—without pain; her general health is first-rate. A leathern splint was made for her by Miliken, and she was permitted to get up. She left the hospital in a fortnight, with injunctions not to attempt to do too much in walking, and to wear the leathern splint night and day. I saw her again on January 21st, 1862. She then had no pain in the knee, thigh, or hip. She could walk half a mile to and from school without pain. The right limb was three-quarters of an inch shorter than the left; the right hip-joint anchylosed, and the limb in a good position. She was in excellent health. The drawing depicts her as she was a little while ago. It was desirable that she should take a proper amount of walking exercise. Vertical pressure upon the thigh-bone was permitted, but the splint was applied for the purpose of preventing any accidental twisting or transverse stress upon the new medium of union between the head of the thigh-bone and the acetabulum. This patient I think you will admit was fairly cured by "mechanical rest."

Hip-joint Disease; Phthisical Patient; Abscess absorbed; Hip Disease cured by Anchylosis.

The next case represents more distinctly the scrofulous aspect. The patient, Mary Ann O'C——, aged seventeen, a dressmaker residing at Woolwich, came under my care at Guy's on the 10th of June, 1857. Her father was phthisical, and she herself had long been in bad health, and subject to prolonged attacks of cough. The patient stated that she remembered that two years previously she fell, and hurt her left side or hip. In the course of two or three days all apparent effect of this accident had passed away, and she believed herself to be then in unimpaired health of limb. Four months afterwards she began to be lame; some days she could walk somewhat better; other days not so well. Bearing any weight upon her foot, or stamping, gave rise to pains in her left hip-joint. She paid little attention to these pains, for some of her friends said they were "growing pains;" other persons attributed them to "the rheumatics," which she inherited from her mother. She soon suffered from continuous and severe pain in the great trochanter and in the gluteal region; and from that time she began slowly to lose flesh. In the course of another month or so she could only just manage to limp about. On admission to the hospital she was in a very weak condition, suffering from great pain in the hip, with cough and expectoration, and suspected disease at the apices of the lungs, there being slight pulmonic consolidation. She could manage with assistance to stand upright on her right leg, and then the toes of her left foot (or diseased side) just touched the ground. In the recumbent position the left thigh was firmly flexed and slightly abducted. Great pain was felt in the hip-joint on pressing the knee or heel upwards towards the hip. A day or two after admission chloroform was administered, and the limb was forcibly straightened; and then a straight wooden splint was applied along the outer side of the limb. Towards the latter end of July the fluctuation of a deep abscess could be felt in the groin below Poupart's ligament. The splint was kept on till the middle of December (six months), when it was removed, as she was then, and had been for a long time, free from pain. The hip-joint was becoming firmly anchylosed, for the pelvis moved with the femur. Yielding to the importunities of the patient, whose condition had so greatly improved, I al-

lowed her to walk about the ward; but she soon afterwards had considerable pain in the hip, and the swelling of an abscess appeared on the outer side of the thigh. I admit that this permission to walk was a great indiscretion on my part; for I had no right to expect that, in so unhealthy a patient, the new structures which formed the medium of union between the two diseased surfaces of bone, or the two articular surfaces which had been diseased, would be competent in six months to resist the morbid effects of direct vertical pressure, or of any movements, or even, perhaps, of continuous vibration upon them. For several days she suffered from shivering, loss of appetite, and other symptoms of hectic, but quickly improved again by resting upon her bed. On February 5th, 1858, after eight months of rest, the femur and acetabulum were firmly united, and the fluctuation of the abscess had disappeared. Here, then, is a phthisical patient, having unhealthy phthisical parents and severe disease of the hip-joint, who has, notwithstanding all this, by keeping the joint at rest by a simple but efficient splint, and remaining perfectly quiet in bed, actually improved in general health (this is the bugbear of many persons, who say you must not keep a patient in bed, because the health is damaged by it), and the hip disease is nearly cured—that is, anchylosis is effected. The patient was able to get about, under my observation, for some considerable time, and then I lost sight of her.

I may say that I have never seen a severe case of hip-joint disease under treatment by rest where the patient has not been improved in general health by rest in bed. As a rule, nearly all the constitutional disturbance has usually disappeared after a short time—two, three, or four weeks. In my opinion, then, it is neither sound in argument nor true in fact to state that the general health of a patient who has hip-joint disease suffers uncompensated injury by lying in bed and keeping the diseased parts perfectly quiet.

One of the most frequent, and sometimes one of the most important, concomitants of hip disease is abscess; but it does not necessarily follow, because we find an abscess near a diseased joint, that it should be in direct communication with the interior of the joint. I have several times seen in the groin and in the popliteal region small abscesses associated with the hip-joint and knee-joint respectively, but simply depending upon an indirect communication through the medium of the lymphatics, and not the result of a direct extension of suppuration from within the knee- or the hip-joint. I have also seen the following erroneous interpretation committed in consultation. The existence of enlarged glands in the groin, associated with hip- or knee-joint disease, or the like glandular condition in the popliteal space connected with knee-joint disease, and a similar state of enlarged glands just above the internal condyle or within the axilla, and accompanying disease of the elbow-joint, have been mistaken as marked local evidence of scrofula. Such glands have entirely subsided as soon as the diseased joints have got well, thus showing their association to be simply with lymphatic absorption, and the arrest of morbid fluid within the glands. No doubt, however, the rule is, that when deep suppuration occurs in close proximity to a diseased joint, it communicates directly with the interior of that joint, and then the question what is to be done with the abscess is brought before the surgeon for his decision.

*Discussion of the propriety of opening Abscesses connected with Diseased Joints.**

This is a very important subject, and the proper answer to the question should be deliberately considered and decided, on physiological principles and those of experience. Some surgeons would say, "I see no harm at all in opening the abscess as soon as it shows itself;" and they accordingly advise that treatment. For my part, I believe such a recommendation to be fraught with extreme danger to the patient, and that it marks the indiscretion of the surgeon. In opposition to such a plan, I would solicit your attention to one or two considerations, for the purpose of showing that the attainment of physiological rest ought to be the guiding principle to direct us in the right course.

In the first place, we know that the healing process of the deeper-seated parts of the body always goes on better when the injured or diseased structures are not exposed to the external air. It must be admitted that if we open an abscess, communicating with the hip-joint, for example, or any other joint, and keep it open, we permit the contact of the external air with its interior. It is well-known that this is the chief agent—or starting-point, if I may so term it—in the putrefactive process; and it seems to be pretty well ascertained that if you exclude air from dead animal tissues they will not become decomposed. Again, if we have a cut, or raw surface, upon the finger or hand, and the denuded structures be exposed to the atmospheric air, we suffer pain, irritation, and local inflammation; cover the raw surface with some harmless material, exclude from it the irritating influence of the air, and immediately all pain subsides. Thus we have analogically presented to us by examples the evidence of the deteriorating influence resulting from the admission of air into the interior of an abscess.

Experience teaches us that so long as an abscess remains unopened, and its walls are kept free from local disturbance by the muscles or other causes, no inflammatory condition is usually manifested upon the walls of the abscess. Then one might fairly say, "Why open it?—why not leave it alone? It is not doing harm in any way, either as regards the original local disease or the general health; why meddle with it?" On the other hand, all surgeons know that when such an abscess is opened, it becomes, or it may become, inflamed, and great local and constitutional disturbance may supervene. The effects of that inflammation will be that the originally diseased parts, as well as the new repairing structures within and out-

* The decision of this question is rendered comparatively easy if attention is paid to the character of the abscess. Two kinds of abscesses are met with in or near joints, viz. the chronic, or "cold," and the acute, or inflammatory. The first variety is characterized not only by the attributes denoted by the above names, by the absence of heat, redness, and pain, but also by the qualities of the pus, which is often thin, presenting caseous masses to the naked eye, and microscopically but few well-formed pus cells, much molecular disintegration, and abundant cholesterine crystals. These are the abscesses which may be left untouched, in the hope of their contents being absorbed. Very different are those abscesses which, to distinguish them from the above, may be called acute or inflammatory, coming on with constitutional disturbance, rigors (often absent or overlooked in children), &c. These should be opened at an early date: if in the joint, they only prepare the way for further changes; and, if peri-articular, they extend rapidly, separating the muscles, and making their way amongst them in different directions, so that the sac, originally single, comes to have numerous processes; lastly, there is always to be borne in mind the liability of their bursting into the joint, especially in the case of the hip and knee.—[Ed.]

side the joint, will participate in both the local and constitutional disturbance, which lowers their vitality. They then soften down or ulcerate, and become subservient to the law, *that inflamed or newly formed or renewed structures suffer rapid deterioration from constitutional or local disturbance.* This is no exaggerated statement; I have seen many illustrations of it. Thus, we know that if a person has had an ulcer recently healed up healthily, or a sore which has closed well after a burn or scald, and he contracts erysipelas (a blood poison), not at the seat of injury, but elsewhere, or is attacked by small-pox, scarlet fever, or measles (blood poisons), the cicatrix, which was perfectly healed, will quickly ulcerate, break down, disintegrate, or entirely melt away. If this be true with regard to external parts, may we not argue that it is equally true with regard to internal structures? If we can see the fact manifested on the surface of the body, that scarlet fever, erysipelas, &c., or local inflammation, can so damage new tissues as to lead to their destruction, whilst those which have not been previously diseased or structurally deteriorated will pass unscathed through that ordeal, surely that is a potent argument against the propriety of opening these abscesses early. These facts form the basis of one of our arguments against the propriety of opening an abscess connected with a diseased joint before it is absolutely necessary, or before the medium of reparation deposited within or about the joint, or interposed between the bones, is so completely consolidated, and so efficiently organized, that it is structurally competent to resist the twofold deteriorating influences of local and constitutional disturbance, or of either of them.

Let us look at this subject from another point of view. If a person suffers from the escape of a large quantity of pus daily, may we not deem it tantamount to his being bled to some extent every day? I think we may. Assuredly, if we were desirous of inducing a healthy local process, or of aiding the general power of repair in a patient, we should not daily draw even a few drops of blood from him, with the hope or intention of improving either his general health or the local disease. That would be adverse to sound physiological principles, against common sense, and opposed to the experience of every one. If a large chronic abscess be opened, it very often, nay, generally, happens that its interior surface freely pours out an abundance of serum, lymph, and pus. It must be admitted that the more it discharges, the more it drains the patient indirectly of his blood, so that I apprehend, under such circumstances, he is being bled every day, and it is painfully apparent that his health becomes greatly and sometimes fatally damaged by it. Nothing can exemplify this position more emphatically than the case of psoas abscess. We see cases where a large psoas abscess exists, and the patient scarcely suffers at all; but directly the abscess is opened, and opportunity is given for it to discharge its contents, from that point starts a course of events which ultimately leads to the patient's lingering death.

A gentleman from Essex brought me his only son (nearly twenty-one years old), one of a numerous family, having a large abscess extending under and below Poupart's ligament, associated with diseased spine. The young man had not suffered any pain, nor was his general health declining, and he was out of doors taking exercise every day. His surgeon suggested that I should see him, as he did not wish to open the abscess. I acquiesced in that advice, and explained to the distressed father the probable contingencies of his son's condition. He went home, and was kept lying down. Soon the abscess began to discharge. From that day

he had an exhausting illness, which gradually wore him out, and in a few months, in spite of all that could be done for him, he died. He was bled to death by the profuse discharge.

Instead of hesitating as to what we should do in the case of an abscess communicating with a diseased hip-joint, I would advise that the opening be deferred as long as possible, until we can be pretty well satisfied that anchylosis or bony consolidation has actually taken place in the joint. If the bony union be perfect, then we may open the abscess without involving the patient in undue risk as regards the repair of the joint, or as regards the general health.

Hip Disease; bony Anchylosis; opening of Abscess deferred; excellent Recovery.

Here I may just refer to a case in point, which I saw some years ago with my friend Mr. Ray, of Dulwich. It is a case which shows well the influence of rest in the treatment of hip-joint disease, as well as the advantages of deferring the opening of the abscess until consolidation has taken place between the femur and acetabulum. You will observe that the hip-joint cases with which I am now dealing are not trifling, but serious cases of disease; but they may usually be said to terminate well, provided anchylosis can be accomplished. This patient, a young lady, came under the care of Mr. Ray in 1846, suffering from disease of the right hip-joint, and continued under his treatment during 1847, '48, and '49. The patient had repeated and well-marked symptoms of hip disease during that period. These were removed at each interval by rest for a short time. In March, 1849, she had an attack of dysentery, which nearly proved fatal, and left her much enfeebled. In June the hip-joint symptoms on the right side recurred, but yielded to rest, counter-irritation, cod-liver oil, &c. She did not, however, regain her former health, and in the early part of December, 1849, between three and four years from the first indication of hip disease on the same side, much more marked symptoms occurred, with great constitutional disturbance. The pulse became very rapid; the pain was of an intense character, suggestive of inflammation of bony structures, and was referred to both the hip and the knee; the upper part of the thigh became swollen; and considerable enlargement could be readily felt at the posterior part of the trochanter major. Leeches and linseed poultices were applied to the groin, opiates and bichloride of mercury administered, and she was directed to wear a leathern splint. In January, 1850, I was consulted. The constitutional and local symptoms were increasing in severity, the pain in the right hip-joint, except when influenced by opium, being unendurable; the child dreading and feeling almost the slightest movement of persons walking gently in the room; the paroxysms of pain and jumping of the limb recurring with increased severity at night. Up to this time the joint had not been sufficiently fixed, nor the local rest sufficiently complete or prolonged, to enable Nature to repair the mischief. A long straight wooden splint, with a footpiece, was now applied to the limb, sedatives freely given towards night, and good fluid nutriment administered. The pain and constitutional disturbance steadily subsided. A large abscess presented itself at the anterior part of the hip-joint, and slowly descended the thigh. Cod-liver oil, steel wine, and quinine were administered as medicines; the recumbent and a fixed position of the diseased joint were strictly and uninterruptedly maintained. These were all the means employed. No counter-irritation, none of the old

horse-doctoring style of treatment—no setons, issues, or painful applications of any kind. In March, ten weeks from my previous visit, I saw the patient again, and found that her health had steadily improved. The abscess subsequently diminished in size, and descended lower down the thigh, and appeared perfectly unconnected with the joint. After eight months of rest, the femur and acetabulum being firmly united, there being no pain in the joint, and no constitutional disturbance, the abscess was opened at its most depending part; it discharged a strumous, purulent serum, containing cheesy flakes and masses. The thigh was afterwards carefully strapped and bandaged, so as to bring the walls of the abscess together, the pressure being made upon the cyst from above downwards. The abscess closed somewhat rapidly. The recumbent position, with the splint upon the limb, was maintained a few months longer, and she regained perfect health, with a firmly anchylosed hip-joint.

The conclusion of the case is this:—She is now in her twenty-first year, in good health, and well grown. The right leg is only half an inch shorter than the left, and she may be said to walk without even a limp. She is an excellent dancer, frequently dancing for a whole evening, and but few persons know, when she sits down, that the right knee-joint is purposely bent at right angles with the thigh, and tucked under the chair to meet the inconvenience of her fixed hip-joint.

This case shows that notwithstanding the continuance, more or less, for several years, of symptoms of diseased hip-joint, with every indication of most serious ulterior consequences, yet by "rest" during many months, and with an appropriate but simple splint, the patient may get well. It also exemplifies in a most emphatic manner the advantage of deferring the opening of the abscess till the medium of union is consolidated between the two bones, so producing perfect anchylosis of the joint.

I may conclude the reasons for recommending delay in opening these chronic abscesses with joint disease by reminding you that the abscess may be absorbed without any harm to the patient. Most surgeons have seen hip disease associated with the clearest possible evidence of fluctuation, from a considerable collection, probably, of purulent fluid in the thigh, and have yet witnessed the spontaneous disappearance of that fluctuating swelling. One of the cases which I have already detailed, and some others which I shall hereafter adduce, open up this question—Is it possible for an abscess to be absorbed? I may reply, that I have not the least doubt about it. I have no doubt whatever that those portions of the contents of an abscess which are not absolutely solid can be completely absorbed. The solid residuum may remain permanently amongst the surrounding soft parts, not doing or leading to any mischief, unless, perhaps the patient should suffer from typhus fever, scarlet fever, measles, or any other physical or moral cause producing severe constitutional depression, as we see exemplified in the cases of bullets that have been buried in the living body for many years, without producing any detrimental effect until some serious injury to the general health occurs, and then there is a discharge. Some years ago I saw professionally a general officer who fought in Egypt against the first Napoleon, and who at that time received a bullet in his right groin; it remains somewhere in his pelvis, and he informed me that he never felt any inconvenience from it except when his health got out of order, and then a small discharge from the wound in the groin occurred. I am strongly of opinion that abscesses can be absorbed without any danger to the patient; but I apprehend that before what may be termed healthy absorption of an abscess occurs, the

pus globules are broken up, and then the altered fluid results of the abscess may be absorbed without injury to the constitution. The solid parts of the abscess may remain.

Chronic Abscess absorbed.

In the year 1850 I had a patient under my care at Guy's Hospital, in whose forearm there was a large chronic abscess. Thinking it a case in which I might put the question of absorption of pus to the test, without risk to the patient, I passed a fine trocar and canula into it under the adjoining healthy skin, so as to draw off a small quantity of pus. That I might be sure there was no mistake about the character of the fluid in this case, a small quantity was examined microscopically, and then the aperture in the skin was carefully closed. The abscess was kept quiet by the arm being placed upon a splint. In a few weeks, and without any constitutional disturbance, the abscess completely disappeared. The patient died some months afterwards from disease of the chest, and I looked with interest to discover the remains of the old abscess at its former site, and there I found some solid cretaceous-looking material, which was doubtless the residuum of the abscess, interposed between the fascia and the subjacent muscles. Anxious to be quite satisfied on this head, I requested my friend, Dr. Odling, to undertake the chemical examination of this residuum, and here is the result in his own words: "A tough substance, of a yellowish color, having the appearance of artificially dried pus. Like the solid residuum of pus, it consisted principally of a butyraceous fat, and of soluble and insoluble albumen, but also yielded an aqueous extractive, or pyin, and an alcoholic extractive. The mineral constituents were chiefly chlorides, sulphates, and phosphates of soda and lime, corresponding with the constituents of the ash of pus."

I think I could not place a more conclusive case before you in answer to the question—Is it possible for an abscess to be absorbed? The abscess in this case was proved to demonstration to exist; pus was drawn off, and examined microscopically; all the fluid portion of it disappeared by absorption; and probably less of the solid residue would have been found if the patient had lived longer.

A large Abscess in the Dorsal Region absorbed.

I had under my care a man who had a very large abscess projecting backwards, and associated with diseased spine in the dorsal region. This large abscess, holding, I should think, a pint and a half of fluid, received a distinct impulsive movement from the interior of the chest during coughing or a full inspiration. By rest in bed for several months the spine disease was cured; and by blistering and rest the abscess subsided—in fact, was gradually absorbed. July, 1862.—This patient is now in Guy's Hospital, suffering from an accidental injury to his foot. There is not the slightest indication of the former dorsal abscess, nor of anything wrong about the spine.

If it be asked—What are the conditions of an abscess associated with hip-joint disease which recommend or justify the making an opening into it by the surgeon? I should say, with all reasonable submission to the experience which I see before me—If the abscess be enlarging very rapidly, and Nature seems incompetent, from her feebleness (a bad indication), to make a successful effort to limit it by a natural barrier, the opening may be made, and half, or more, of the pus be drawn off (with-

out squeezing the abscess). The opening should be immediately and carefully closed up, lest the outpouring of the fluid may be continuous, and a drain of pus be produced so as to affect the general health. The abscess should be subsequently supported by plaster or bandage, in order to keep it at rest.

If the walls of the abscess become inflamed, hot, and painful, with great febrile and constitutional disturbance—or if the abscess contain air (resonant on percussion), from decomposition, mixed with the fluid, the opening ought to be made large enough, and at the most depending part of the abscess, to allow gravitation to determine at once the evacuation of the whole of the fluid in the abscess. Subsequently the walls of the abscess should be kept in contact for the purpose of inducing, by pressure and rest, mutual adhesion, and of limiting the extent of surface capable of discharging too abundantly *pus*, *serum*, or *lymph*, which would diminish both the quality and quantity of the blood, and so deteriorate the general health.

I felt myself bound to return to this subject of abscess associated with diseased joints, because my experience will sustain my recommendation as to what should be done in such cases; and, further, because it is a fact that surgeons by the bedside are often in doubt as to what course they should pursue. I hope the facts and arguments which I have now adduced may be a slight contribution towards a right determination on this subject.

Disease of the Left Hip-joint (Scrofulous?); good Anchylosis; large Abscess absorbed.

J. W. P—— came under my care in 1852: he was then nine years of age. The drawing before you represents the patient as he was in 1861. The disease came on without any known accident. He had measles badly in July, 1850, and had not recovered his health when the pains began in his left hip, in the early part of October, 1850. He was under treatment at home, getting daily worse, until his admission into Guy's Hospital, Feb. 2d, 1852. His general health was then very bad; constitional disturbance excessive; thigh flexed and adducted; foot turned inwards; dreadful pain in the hip, and some pain at the knee. Considerable diffused general swelling existed, and extensive fluctuation, most distinct at the upper and anterior part of the thigh towards the outer side of the hip-joint. He could not bear any weight upon the foot, which was pointed downwards and inwards. Nothing was done beyond placing him in a recumbent position, and then applying a long, straight wooden splint, extending from the foot to the armpit; giving him good food, and occasionally some aperient — no other medicine of importance. Within a few days after the application of the splint, his freedom from pain and the subsidence of the general constitutional disturbance were so marked, that it was not thought necessary to adopt any new measure; the splint, occasionally readjusted, was worn uninterruptedly for four months. At the end of that time, his friends, seeing him apparently so well, begged that he might be al-

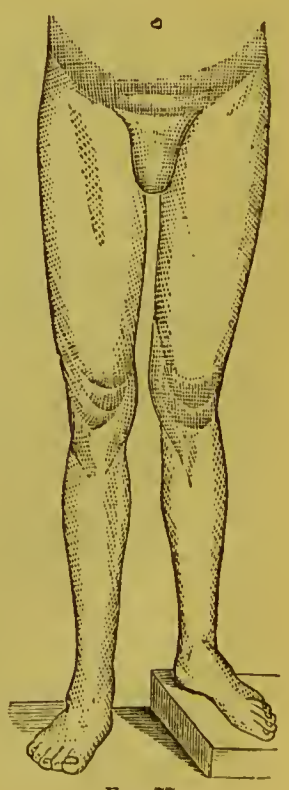


Fig. 77.

lowed to go to their home, at Bexley Heath, for change of air. He went there, and came back in about six weeks, rather worse, not having been sufficiently nourished, nor kept so quiet as he ought to have been. When he returned to Guy's, the straight splint was reapplied, and kept on during three months longer; after that he had a leathern splint (like Fig. 66) made, so as to embrace the pelvis, thigh, and knee, and he was allowed to get up. He wore this splint during the next year until he was too big for it. The diseased limb was then in good position, but a little shorter than the other; the abscess and all other local indications of disease were gone. I feel confident that if I had ventured to open the abscess, I should have made a starting-point of deterioration in his health which would have led to his death. I feel as confident as experience and reflection can make me, that that would have been the result. On looking at the drawing (Fig. 77), you see very strong evidence of a former most seriously diseased condition of the right hip-joint. From the time he left Guy's, he moved about with his crutches, in good health and growing fast, doing nothing beyond attending to school during nearly three years, when he found he could walk very well without his artificial support. I saw this lad repeatedly, and watched his progress with great satisfaction. On the 24th of March, 1861, the patient called upon me in good health: he had not been really ill since he left Guy's. He could walk seven miles easily with a thick-soled and high-heeled shoe. The growth of the left limb had not kept pace with that of the right. The left half of the pelvis, measured from the median line to the posterior or to the anterior superior spinous process, was not so broad by three-quarters of an inch as the right. Here is a point worth bearing in mind, especially in reference to females under like circumstances—whether with hip-joint disease there may not be some deformity or want of symmetry in the two sides of the pelvis (see p. 201). I think we have distinct evidence that it is so: it was well marked in this case. The left posterior superior spinous process was nearly three-quarters of an inch above the transverse level of the right; the left side of the pelvis was altogether higher on the left than on the right side; and he said he had himself noticed that his left hip was nearer to his ribs on that side than on the right side. I may here allude to the fact that great care is required in taking the measurements, so as to compare with accuracy the relative length of the two lower limbs. The patient should lie flat on his back on a firm mattress, with the legs extended and parallel. The point of the anterior superior spine of each os innominatum should be felt for, and the overlying skin marked very accurately, for the mobility of the skin in this region may easily cause an error in the measurements. These should then be taken from the above-mentioned point of bone, along the inner side of the patella, down to a transverse ridge which can be felt upon the inner surface of the internal malleolus, and just above its tip. By noting the following measurements, it will be seen that there is defective development in each segment or portion of the lower limb on the diseased side. Measured from the anterior superior spinous process of the ilium to the lower part of the inner malleolus, the length is as follows:—



Fig. 78.—Ground-plan of J. W. P——'s feet, showing the smaller size of his left as compared with his right foot.

	Right Side. Inches.	Left Side. Inches.	Difference. Inches.
	33	31	2
Femur	19	17¾	1¼
Tibia	14	13½	0½
Length of foot	11	10	1

Right patella larger than left.

Here, then, is a case of hip-joint disease, very severe in character, very enduring, cured by "rest," and the abscess absorbed. The patient, when I saw him last, was perfectly well. He was to be found at Beckenham, selling books for Messrs. Smith and Co. at the railway station.

In all the cases of hip disease which I shall detail, a straight splint was applied. I believe an impression is abroad that, by applying a straight splint to cases of this kind, we are likely to give the patient an inconvenient limb, in consequence of the limb being fixed in a straighter position than the other, and that this would necessarily interfere with progression: and perhaps it would be so if the limb retained its proper length. But it is a fact that the diseased limb does not grow quite so fast as the other; hence it is always a little shorter. And again, although a straight splint be applied, the direction of the thigh-bone is scarcely ever perfectly straight downwards from the pelvis, but a little forwards and downwards. I do not, therefore, acquiesce in the view of some surgeons, that it is better to put on a splint which makes the hip-joint permanently somewhat flexed. I believe, on the whole, a straight splint is the best.

Diseased Hip-joint, with Suppuration of the Left Side; cured by Four Months' Rest; Abscess absorbed.

William T——, aged eighteen, was admitted on the 30th of September, 1861. He is a clerk in a printing office. Three months ago, when in good health, he slipped down several steps, but did not fall. He strained his left hip severely, immediately became lame, and on the following day could not stand. He had been lame and confined to the house and to his bed up to the time he came to Guy's Hospital, except when on two occasions he was taken in a cab to different hospitals, where he was ordered lotions, blisters, and medicines. On admission, the thigh was flexed, adducted, and fixed towards the abdomen; the hip-joint was extremely painful on moving it in the slightest degree, or on making pressure over the anterior part of it, where the distinct fulness and fluctuation of an abscess could be felt; pressure on the trochanter major caused pain in the hip-joint; so did striking the sole of the foot, or pushing the limb upwards from the knee-joint; great starting and jumping of the left leg, especially on going off to sleep. Full diet.

Oct. 8th, 1861.—Chloroform was administered, and the limb forcibly straightened: a long outside wooden splint applied; no special medicine, except opium to induce sleep and to relieve pain; some aperient medicine now and then.

In a fortnight the pain and jumping of the limb had subsided gradually, and in two months all pain was gone; he was quite comfortable, and could move himself in bed without pain.

Jan. 2nd, 1862.—The splint was taken off to-day; the limb can now be moved and handled without causing any pain in the hip-joint, whilst formerly it caused exquisite pain; no pain on pressing the trochanter major, or tapping the heel or knee; no swelling over the joint anteriorly.

On attempting flexion of the femur, the pelvis moves with it, indicating anchylosis. The limb appears longer than the sound one (although in reality it is a quarter of an inch shorter), on account of the obliquity of the pelvis. There is also flattening of the nates on the affected side.

Feb. 3rd.—There is now no pain whatever in the hip; he can walk very gently about the ward without the aid of either crutches or stick, and feels perfectly well in health.

4th.—The patient left the hospital to-day, with directions to be careful that his exercise in walking does not cause a return of pain in his hip.

This is important advice, for the *new structures—the medium of consolidation*—will not bear rude concussion or straining. Here is a drawing of his actual condition at the end of February, 1862 (Fig. 79).

I saw this patient in 1863; he was wearing a leathern splint, and taking very moderate or limited exercise. Being an intelligent lad, of a literary turn, and connected with the printing business, he used to occupy himself with reading at home, and taking very carefully adjusted exercise; the union between the acetabulum and the femur not being, at that time, perfectly consolidated.

Diseased Hip-joint, supposed to be Gonorrhœal in origin; Abscess opened by Nature; portions of Bone extruded by Granulations; cured by Rest, with permanent Anchylosis.

F. P——, aged twenty-two. Early in the spring of 1859, his health being previously quite good, he had gonorrhœa, which ran its usual course and left him. In June he had severe pains down the inner side of the right thigh, and the inner side of and within the knee-joint; these were attributed to rheumatism, and a physician who was consulted gave his opinion that it was gonorrhœal rheumatism in the knee and hip. However, the pains became increasingly severe, in spite of abundant medicine, blisters, leeches, &c. The 13th of July, 1859, was the first day on which he remembers having any pains whatever in the hip-joint, and, although they were slight, he was obliged to use a stick to get about the house. The anti-gonorrhœal treatment was continued until the 24th of August, when Mr. Elwin, a surgeon in my neighborhood, saw him for the first time. "He then had extreme pain in his hip-joint; the slightest movement—even a person walking across the room—appeared to shake him, and caused him great agony in his hip." This is Mr. Elwin's own statement. "His diseased leg was apparently three or four inches shorter than the other, from the femur being flexed and adducted, and the knee-joint flexed. There was the fluctuating swelling of an abscess in the groin." I saw the patient, in consultation, on the 1st of September, 1859, and recommended the application of a long straight wooden splint, absolute quiet in the recumbent position, good diet, and the twelfth of a grain of bichloride of mercury twice a day in some bitter infusion. The only known injury the patient could connect with his hip disease



Fig. 79.

resulted from a sudden and violent effort he had made in swimming, which produced at the time some pain in the right groin and hip. The straight splint was applied immediately. I saw him again in November; he was then free from pain; the right leg was a little shorter than the left, and the hip-joint had become anchylosed, the pelvis moving with the thigh; both the swelling in the groin and the fluctuation had nearly disappeared. He was recommended to keep recumbent a few weeks longer, but without the splint, except at night; and thenceforward to use great caution in walking.

In such cases I think it is better, when a patient is improving, to put the splint on at night, especially in the case of children, because the involuntary muscular action which often takes place on going off to sleep is likely to disturb the hip-joint again. During the time the patient was in bed with the splint on, his general health did not suffer—indeed, it was improved; the only difficulty was with his bowels which were constipated; he had also temporarily a small bed-sore on his sacrum.

In January, 1860, he could walk about well with his crutches. He passed the summer and autumn of that year at Swanage, getting out of doors occasionally, and resting the joint at other times by lying down. During his stay at the sea-side an abscess appeared in the thigh, and opened spontaneously by ulceration. Several portions of bone have come away at intervals through three sinuses since March, 1860. When I saw him in February, 1861, his health was excellent, he was free from pain, was able to walk a distance of two miles, and could stand about all day. He can now (1862) walk ten miles without pain or weakness in his right leg. I have some of the portions of the bone which came out of the apertures in the three sinuses. The anchylosis is now perfect.

This case, I believe, supports very decidedly the view which I have expressed as to the great value of "rest" in the treatment of disease of the hip-joint.

LECTURE XVI.

Hip-Joint Disease; No known Accident; Sequel to Scarlet Fever; cured by Anchylosis, after a few months of Rest—Local Affections after such Diseases as Scarlatina, Measles, etc., arise from Previously Unhealthy Structures Suffering Rapid Deterioration from the Effect of the Constitutional Disturbance—Two Cases in Illustration—Diseased Hip-Joint, with Necrosis of Acetabulum, Cured by Rest—Hip-Joint Disease—Anchylosis, with Thigh somewhat Bent—Cases Simulating Hip-Joint Disease Due to Deficient Nervous Influence; Treatment—Curved Sacrum, Causing Outlying Symptoms of Hip-Joint Disease—Congenital Malposition of both Hip-Joints—Congenital Deficiency of Development of one Lower Extremity Resulting in its being Shorter than its Fellow; Effects of this—Diseases of Sacro-Iliac Joints—Disease of the last Lumbar Vertebra Simulating that of the Hip-Joint—Severe Disease of Spine close to Pelvis Cured by Rest—Disease between Sacrum and Ilium, with Intense Pain in the Leg of the same side.

Pursuing the subject of hip-joint disease, I purposely select the next case for your consideration, because it was apparently associated with scarlatina as a cause. I think it must have fallen to the lot of almost every surgeon to see disease of the joints or disease of the bones occurring as one of the important sequelæ of scarlet fever. It appears, as far as I can ascertain, that the cause of that association has not hitherto received its proper or true interpretation. I will not pretend that the cause which I shall offer, is the only one (according to many, these sequelæ have a pyæmic origin), but it is one that long ago occurred to my mind, and to which I have frequently referred in my hospital teaching.

Hip-joint Disease; no known Accident; Sequel to Scarlet Fever; cured by Anchylosis, after a few months of Rest.

A young gentleman, aged fourteen, a toleraby healthy lad, had a severe and prolonged attack of scarlet fever, at the Bluecoat School, in the winter of 1859. As he was recovering from the fever, or soon afterwards, he complained of pain in his left knee, and became lame, without the occurrence of any local injury. This was thought to be rheumatism, and local applications, including strong mustard poultices, were applied to the knee, and anti-rheumatic medicines were administered, without any improvement in his condition. As his general health was at that time not good, he was sent home for change of air, and I saw him at my own house on February 10th, 1860. He had then all the local indications of acute disease in his left hip-joint—viz. intense pain in his knee and hip-joint on attempting to bear any weight upon the pointed toe, or on making any attempt to move the hip-joint; but none in the knee on movement of that joint only. The thigh was flexed, and the foot turned downwards and inwards, with a strong tendency on the part of the head of the femur to dislocation backwards. Obscure fluctuations could be felt deeply seated behind the trochanter major under the gluteal muscles. Three days afterwards I went to his home, and applied the splint here delineated (Fig. 80) to the left leg and pelvis, in order to prevent his moving the limb.

He was directed to take a dose of castor oil or of confection of senna occasionally, and one-sixteenth of a grain of bichloride of mercury, with one drachm of tincture of bark, twice a day. At his residence, near Highgate, he was placed in a small but airy room on a hair mattress, and not allowed to get up for any purpose. Within a fortnight he was nearly free from pain both day and night; whereas, before the application of the splint, his nights were dreadful to himself, as well as to his father and mother, who heard his expressions of distress.

During the three following months the patient remained uninterruptedly in bed, with the limb securely bandaged to the splint. When the severity of the symptoms had subsided, I was particularly struck with the rapid and marked improvement which occurred in this case, when measured by the extreme simplicity of the treatment adopted. There was no other surgeon in attendance, and I saw him only once a month, and then merely for the purpose of readjusting the splint. In the latter end of May, 1860, all the symptoms of active disease were absent, and the deep sub-gluteal fluctuation had disappeared; anchylosis had taken place between the femur and acetabulum, with the limb and foot in a good position; the pelvis moved with the femur, and the length of the left limb was the same as that of the other side, without either inversion or eversion of the foot. On taking him out of bed, at the expiration of four months, he found he could bear some weight upon the lame leg. From this time he was allowed to get up daily, and move carefully about with the support of crutches. In June, 1860, he went to Margate, and remained there until the end of September, being the whole time in excellent health, and free from pain. He lived out of doors the greater part of the day, walking with the aid of his crutches, but usually bore more or less weight upon his lame leg; and he sometimes walked short distances with the support of one crutch and the arm of his mother. On his return home he continued his walking exercise, with daily increasing strength in his leg, using his crutch for security against accident. The general health was perfect (this is not too strong an expression) until the end of October, when, with one crutch, he climbed into a loft containing apples, of which "forbidden fruit" he desired to taste. Somehow his crutch became entangled between his legs and a hamper, forcing his left leg behind the right one, and he fell helplessly upon the floor. Unfortunately, he fell upon his left leg, striking his left knee, and straining with great violence the left or diseased hip-joint. He became faint and nearly insensible, and was carried from the apple-loft indoors. The knee became much ecchymosed and swollen, and the hip near the trochanter major was very painful when pressed upon; but no fracture could be detected by the surgeon who then saw him, and the two limbs were of the same length. The patient was confined to his bed about a month, and then allowed to get up and resume his walking exercise.



Fig. 80.

In the early part of 1861 he found that the neighborhood of the tro-

chanter major had become enlarged. I saw him at my house on March 10th: he was in very little pain; he could bear some weight upon the left limb, but less than when he came from Margate. On examining him I found a large abscess behind the trochanter major, with a very thin covering of slightly reddened skin at one part; considerable increase in size of the upper third of the thigh-bone; little or no pain at the hip-joint itself, but tenderness on pressing or grasping the trochanteric epiphysis and adjoining portion of the shaft of the femur. His general health was good. Two days afterwards I opened the abscess, and let out nearly a pint of unhealthy pus mixed with some clotted blood and some curdy matter, but it was not decomposed or offensive to the smell. The abscess was at once completely emptied, and nicely adjusted pressure was made by a thick pad of lint and a bandage round the pelvis, so as to coapt the outer and inner surfaces of the abscess; the lancet aperture was left open, and he was desired to lie quietly in bed. Little constitutional disturbance followed the opening of the abscess. I saw him again in a fortnight: he was well in health; appetite most excellent; the walls of the abscess had adhered throughout nearly four-fifths of its extent; and the discharge was chiefly serous, small in quantity, and mixed with but little pus. The enlargement of the shaft of the bone near the trochanter major was considerable, and slight pain was complained of on direct pressure.

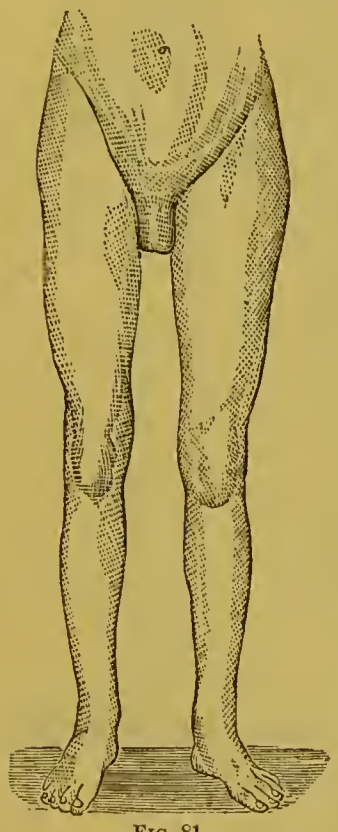


Fig. 81.

I saw no more of this patient until January 15th of the year 1862. He was then seventeen years of age, and could walk five or six miles easily without pain. There was scarcely any lameness, and here is a drawing of his actual condition (Fig. 81). This is a good case, which not only illustrates the advantage of treating hip-joint disease by "mechanical rest"—as a very simple but successful means for cure—but also carries with it another important indication; namely, that the injury which he received later on to the trochanter major did not lead to any secondary deterioration at the hip-joint itself, showing the perfection of the repair which had there taken place. The case also clearly points out the advantage of accurately coapting the walls of a large abscess after it has been opened.

I now avail myself of this case to introduce one or two remarks which bear upon it.

I think it may be fairly stated that unhealthy structures suffer rapid deterioration from the depressing influence or effect of any severe constitutional disturbance, such as occurs in scarlatina, measles, erysipelas, small-pox, and similar diseases. And herein lies the interpretation which I would, with all deference, submit to you in regard to these cases of local disease, apparently associated with, and resulting from, the development of scarlatina, measles, small-pox, or erysipelas; namely, that at the time, or previous to the occurrence, of this depressed constitutional condition—a condition, in all probability, of blood poison—those parts which subsequently assume a diseased condition were not in a healthy state. If this

be true, these obscure cases will come under the law which I have just endeavoured to present to you in these few words; namely, that unhealthy structures suffer rapid deterioration from the depressing effect of any severe constitutional disturbance. I will now place before you two cases which tend to sustain this view, and which are to my mind satisfactory instances of this class of cases.

Necrosis of Left Tibia and Anchylosis of Ankle-joint consequent upon Scarlatina and previous Local Injury.

The following drawing (Fig. 82) represents the legs of a patient who had scarlatina, and, as a sequel, necrosis of nearly the whole of the shaft of the left tibia between the upper and lower epiphyses, leaving the knee-joint unimplicated, but involving the ankle-joint, which has become anchylosed. The shaft of the tibia has been reproduced by Nature.

The other drawing or ground-plan shows also that the two feet have not developed in an equal ratio (Fig. 83).

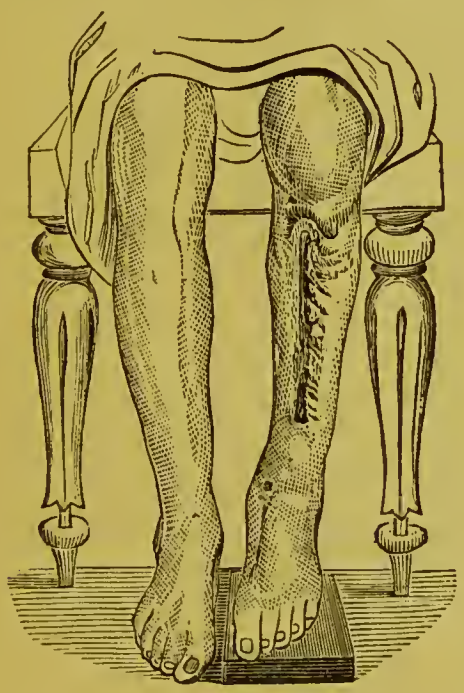


Fig. 82.



Fig. 83.

The history of the case is very short. The patient was at school in Scotland, and Dr. White, of Athol Place, Perth, has obligingly forwarded to me these brief notes:—"The epidemic of scarlatina at Glenalmond School began the last week of September, and G—— was sent into hospital on the 6th October with a slight sore throat and other precursory symptoms of an attack. In this condition, but with no eruption, he continued till the 12th October, when the throat affection left him, and he first complained of pain and swelling above the internal malleolus of the left ankle. In a day or two it assumed the character of a diffused inflammation of the cellular tissue, associated with severe constitutional disturbance, and the local mischief rapidly extended upwards to the knee, followed by extensive suppuration and sloughing of integuments over the tibia, exposing the denuded bone. About the 22nd of October the throat affection again appeared, accompanied by an eruption and other symp-

toms of scarlatina; the efflorescence (which was dusky and livid) began to fade in three or four days, and desquamation followed, as in ordinary cases. On the 23rd November he left Glenalmond for London."

Now it appeared, upon inquiry of this young gentleman, that during the summer he had felt at times an aching pain in his left leg, which he thought was due to a blow from a cricket-ball. When he was at all tired, it ached so much that he could hardly walk, but still there was no appearance of injury. Here, then, was a patient under the influence of blood poison in the form of scarlatina, which never developed itself thoroughly or completely, but seemed to concentrate all its morbid influence—upon what part? Why, upon the part which was recognized by the patient as being at the time of the occurrence of the scarlatina in a depressed condition vitally, and perhaps structurally also, for he had suffered pain in it after ordinary exercise; therefore there was an indication of something wrong. The lad was brought to London, and when I first saw him his general health and his leg were in a most deplorable condition. The whole of the tibia, from the lower epiphysis upwards to the tubercle of the tibia, was exposed and necrotic. The integuments had sloughed to a very considerable extent, and there was acute disease of the ankle-joint, with great œdematous swelling about the foot.

Judging by the history of the case, it was associated with some local injury previous to the scarlatina. Notwithstanding the very low condition of his health and the great extent of local mischief, we (Mr. Collambell and myself) thought, considering his age, that we might, perhaps, by time, good feeding, and careful professional attendance, enable Nature to repair the injury, and renew the destroyed soft textures and bone. His leg and foot, swollen and painful, were placed upon an iron splint, provided with a screw behind the knee, so that we might gradually straighten the flexed knee-joint, and the whole limb was swung under an iron cradle. He was in excessively bad health, and his life was, doubtless, threatened. However, by great perseverance, excellent nursing, and unremitting domestic care on the part of those in the house, he arrived at the state you see represented here (Fig. 82). The whole of the middle part of the tibia became separated, and I removed it in several portions; new bone was thrown out, and all the soft parts healed over, except at the point indicated in the drawing, which was the outlet of a sinus passing under the tendons of the extensors over the ankle-joint, and probably connected with diseased bone, which, however, I could not discover. Fifteen months after his scarlatina, he entered my room walking with crutches, but bearing some little weight upon his leg, and he found that he could stand upon the diseased leg with the aid of a little support. He is now (1876) a clergyman, doing active duty in the neighborhood of London, and able to walk five or ten miles without any difficulty. The tibia has been thoroughly and firmly restored.

This case displays the wonderful reparative powers of Nature at an early period of human life, and, I think, justifies the interpretation which I have affixed to it—viz. that his leg was in a deteriorated condition, as regards the bone, at the time when the scarlatina occurred; and that the depressing influence of that blood poison led to the death of the bone.

Disease of the Lower Jaw consequent upon Scarlatina and previous Local Injury.

Here is another instance, which carries with it the same kind of history, and, I think, the same interpretation.

A young gentleman, aged fourteen, remembered that he had a blow on the right side of the lower jaw with a hockey stick in March, 1857. He had previously been in his ordinary health. After the blow he had occasional pains in the jaw, but nothing important occurred. In four or five weeks, he did not exactly know which, he went home to Sydenham to see his brothers and sisters, who at that time had scarlet fever. He stayed at home a fortnight, and then returned to school at Blackheath. In a few days he became poorly—feverish and depressed, with a very slight sore throat. The lower jaw then, for the first time, began to swell and to be very painful. I saw him at Sydenham, with Mr. Corbould, early in June, 1857, about three months after the blow, and six weeks after the exposure to scarlatina. The lower jaw was then enormously swollen; every tooth on the right side was loose, and could have been easily taken from the jaw by the fingers alone. The incisors, the canines, and the bicuspids, on the left side, were all more or less loose. The whole jaw was painful and tender on pressure, from ostitis and periostitis. There was subsequent suppuration, resulting in several small abscesses, which I opened, and from one of them I removed a thin plate of the lower jaw.

The explanation of the case appears to be this:—The boy has a blow, not a severe one, upon his lower jaw; he has occasionally slight pains in it; no swelling, no evidence of local inflammation manifests itself; he goes home, comes within the influence of scarlatina, or a blood poison, returns to a healthy spot at Blackheath, becomes very feverish, has sore throat, the lower jaw becomes swollen, and then he returns home in the condition I have described. There he remains under the influence of tolerably good air, abundance of fluid nourishment, and scrupulous domestic care, and ultimately regains perfect health.

The subject of "rest" is well exemplified in this case. We found all his teeth loose, and felt certain that if we were not very careful to prevent their disturbance they would fall out of themselves. On the other hand, it was essential to his cure that he should be well nourished by food: fluid nourishment and wine were abundantly and carefully administered, and the result was that all his teeth became refixed by Nature, with the exception, perhaps, of one, and the jaw subsided to its natural dimensions. I called on the father of this patient recently to ascertain his actual condition, and present it to you free from exaggeration, and with every element of truth. His father said, "My son is in Scotland; the front tooth is not out, but it is rather loose; as regards everything else he is perfectly well." Now, here are three cases. I could adduce many others equally illustrative, which I think display in a striking manner the depressing influence of blood poison upon parts already in an unhealthy condition. This may or may not be the true interpretation of such cases; but I venture to express my opinion and conviction that it is so.

Case of Diseased Hip-joint, with Necrosis of Acetabulum, cured by Rest.

The next case of hip-joint disease is one complicated with disease of the acetabulum; and that is its special feature. A delicate, pale, unhealthy-looking young gentleman, aged fifteen, in the spring of 1846, after taking a long walk, suffered much pain and some swelling in his right hip-joint. He was then in Edinburgh, and was kept in bed during three months by his surgeon's advice, his thigh being strapped up with some irritating plaster spread upon leather. Slowly recovering from this

attaek, he eontinued well until August, 1847, when over-exertion brought on his hip-joint symptoms again more severely than in 1846, and he remained at home in London, under the eare of an hospital surgeon, alternately keeping and quitting his bed at short intervals, so that the joint had not the advantage of continued rest, until the end of 1847, when, notwithstanding numerous leeches, lotions, strong counter-irritants, and abundance of medieine, all his hip-joint symptoms became much worse. As to leeches, he said to me, "I have had upwards of 1,200 applied to my hip in the course of a few months!" The loss of blood by 1,200 leeches may be estimated at about 300 ounces. This is pretty well for a delicate lad suffering from hip-joint disease. He told me he had taken "pailfuls of horrid medieine." The loss of blood, the physic, and the counter-irritation reduced his strength, and brought on loss of appetite, want of sleep, with jumping and starting pains in the limb, to sueh an extent that he was compelled from sheer exhaustion to keep flat upon his back, and so remain uninterruptedly at rest upon his bed; and from that time he began to improve in every respect.

Here, then, was a case of "foreed rest" against the judgment and discretion of the medical attendants—forced rest compelled by direct feebleness on the part of Nature; and from that time the patient began to improve. He continued in bed until the summer of 1849, nearly eighteen months. The blistering and counter-irritants that were applied were, aceording to his own account, something awful. Even when exhausted in bed his surgeon would not let him alone, but still applied blisters, setons, and counter-irritants. A large abscess made its appearance in the spring of 1849, just above Poupart's ligament, near the anterior superior spinous process of the ilium. The skin was allowed to ulcerate, the discharge was immense, and was dashed out of the opening by coughing or sneezing, or by taking a full breath, indicating an intimate association of the abscess with the interior of the abdomen and pelvis.

I first saw this patient in the autumn of 1849, lying on his bed, not pale, but almost transparently white (I never saw a man so white—I might almost say translucent—as he was), thoroughly exsanguine, and exceedingly emaciated. Abundance of thin pus was escaping from two sinuses—one at the upper and inner side of the thigh, and the other, before alluded to, close to Poupart's ligament. Through the opening of this latter abscess I passed a long probe into the pelvis behind the acetabulum, and there felt necrosed or carious bone. The discharge from this abscess occurred most abundantly during the effort to evacuate the bowels, when it would gush out. There was scarcely any pain in the hip-joint. I ascertained by eareful but painless examination, although he was in great fear the whole time, that the thigh-bone and the anterior part of the acetabulum were firmly united; the limb was in good position, except that the foot was a little too much everted. Seeing no advantage in his lying any longer in bed, he was daily dressed, laid upon a couch, and, as soon as the weather and his own extreme feebleness permitted, he was taken out of doors into the garden, lying there all day upon the couch.

In the spring of 1850 he passed nearly all his time out of doors, sitting in a Bath ehair in the garden, or being dragged about in a small hand-carriage. From the time of my first visit he left off all medicine except cod-liver oil and steel wine, and took porter, wine, meat, &c., in abundanee. In 1851, amongst other efforts, he went to the Exhibition, resting on his crutches; and in 1852 he was employed in a publie office, where he has been constantly occupied ever since.

On March 21st, 1861, he called on me in good health, well covered with firm flesh. He belongs to a rifle corps, goes through the drill, and can walk ten or twelve miles without pain; but the exertion of walking beyond that distance brings on fatigue, which he attributes to his stiff hip-joint. Several small portions of cancellated bony structure have been extruded from the upper abscess at three or four different times, but none during the last four years. The sinus from the intra-pelvic abscess does not remain closed for more than three or four months at a time, when a little pain and fulness occur under the closed aperture. This soon opens of itself, or he himself opens it. About a teaspoonful of pus escapes, and in a day or two nothing but a thin watery fluid oozes out, and then it remains closed during another three or four months. He walks somewhat lamely, dipping the pelvis a little to the lame side when he touches the ground with the foot of that leg. Standing upright upon the sound leg, the heel of the lame side is about an inch and a half or two inches from the ground. The head of the femur in this case is a little anterior in position to where it ought to be. That explains a slight fulness below Poupart's ligament which impedes the easy return of the blood, and produces a varicose condition of his superficial veins. The muscles of the damaged leg are exceedingly well developed, but not quite so much so as on the sound side.

I think I might fairly refer to this case as one of diseased hip-joint complicated with disease of the acetabulum, not placed under very favorable circumstances as regards professional treatment, and, consequently, not as regards rest. Yet, in spite of all, so strong have been the energetic efforts made by Nature, that the patient is, in his actual condition, happy and comfortable; equal to all the duties of the office in which he is employed, capable of taking exercise, and able to form part of a volunteer corps.



Fig. 84.

Hip-joint Disease; Anchylosis, with the Thigh somewhat bent.

The next is a case of hip-joint disease, with anchylosis. The patient was sent up to me for the purpose of reducing, if possible, the hip-joint deformity. The drawing before you represents the state of the patient when he came under my care at the hospital. The bent condition of the limb was all he had to complain of. During the course of the hip disease he had never been kept at rest on his bed, but allowed to get about daily upon his crutches. The course of the disease had been slow, and its results was anchylosis of the thigh-bone to the acetabulum. In November, 1855, chloroform was administered, and powerful attempts were made to straighten the leg; but our efforts, limited to what we thought judicious and discreet force, failed, and the patient left the hospital with the limb in the same condition as when he was admitted. With respect to this application of force to disturb anchylosed joints, it is not my intention to do more than express a doubt as to the propriety of it in many cases, especially in hip-joint disease. The hip-joint is remarkably simple in its construction. The adaptation of the convex head of the thigh-bone to the concave or cup-like cavity of the acetabu-

lum allows of easy coaptation, and this is one of the conditions which contribute to quiet and perfect consolidation of the opposed bony surfaces. I can hardly conceive any important disease occurring in the hip-joint terminating in a simple fibrous adhesion. In this instance I used all the force I thought justifiable, and it failed to improve the position of the thigh-bone.

I saw a distressing case of this kind some years ago. I had attended the daughter of a grocer, suffering from severe hip-joint disease, in the Kent Road, and had taken a great deal of trouble with the patient in order to obtain anchylosis of the hip-joint, and fortunately succeeded. I lost sight of the young girl for some time, when the late Dr. Barlow said to me, "I wish you would call at Mr. ——'s; his daughter is now very ill, and she wishes to see you." I called, and as soon as she saw me she burst into tears, and said, "I am sure soon to die, and I am anxious to express to you my deep regret that I did not follow your advice. When I left your care I had a stiff hip-joint, and you advised me to be satisfied with that state. Following the advice of friends, I went to Mr. ——, who said he could cure my stiff joint and make it movable." This gentleman employed a great deal of force in order to disturb or break down the bony union; fresh mischief was set up, which resulted in large suppuration, so extensive as to resist all subsequent treatment. Her general health was so much depressed by it that she died of phthisis, with the hip-joint deformity worse than when I had last seen her. That is the short history of a case which I consider exceedingly melancholy. The patient had a useful, painless, but stiff hip-joint. My surgical successor assumed the power of correcting Nature, and rendering the limb flexible and movable; yet it turned out in the end that his efforts only resulted in the patient's death.

Cases of Lameness in Children, due, perhaps, to deficient Nervous Influence, simulating Hip Disease.

No doubt it happens to most consulting surgeons to see cases of lameness in children (in some instances both lower extremities being affected, in others only one), which are only to be diagnosed by the law of exclusion, as not being explicable by any recognized morbid condition. They occur sometimes as a sequel of a severe fever, as in the case quoted below. They seem to result from some defect in the supply of nerve influence, as evidenced by the wasting of the limb and the retarded growth of the muscles and of the bones. This leads to want of power in the limb, and deficient precision of step, and thus to unsteady gait; but the limb is not flexed or adducted, nor is there usually any distinct pain when the patient walks, which he does limping a good deal. This limp, however, is unaccompanied by the peevish anxiety which usually attends the existence of hip disease; there is no evidence of local heat, or pain, or tenderness in the hip-joint itself; in fact, the symptoms of hip disease are not well marked.

As the affected limb is, as a rule, strikingly defective in warmth, I have found that the best method of treatment is to endeavor to remedy this defect by rubbing the whole limb night and morning with sperm oil, either by itself, or, when extra stimulation is required, by the addition of liquor ammoniæ to the oil. During the night the limb should be surrounded by cotton wool, and during the day with flannel or any similar material.

Should the ankle or knee show any tendency to yield laterally, the

most simple mechanical apparatus should be used, so as not to confine or make pressure upon the muscles. Walking exercise short of fatigue should, as far as is possible, be daily persevered in.*

Typhus Fever followed by Paralysis of the Left Leg; Recovery much aided by rubbing the Limb with Sperm Oil, and subsequently with Sperm Oil and Liquor Ammoniæ.

A little girl, aged six, having previously had good health, was seized with severe fever (with brain disturbance during about a fortnight), from which she recovered gradually. The left leg and foot, however, remained shrunken, with greatly diminished power, and inability on the part of the patient to direct the foot with precision. The limb was always cold except when made warm with artificial heat; various kinds of friction and electricity had been tried during many months, but without any improvement. When I was consulted in this case I advised that sperm oil (liquor ammoniæ was added afterwards) should be well rubbed into the limb night and morning, and lamb's-wool stockings worn.

By these means the limb was made warm, and maintained so. Nothing else was done. I have seen this patient since several times, the last occasion being April, 1876. She can now walk and run with precision, the muscularity of the limb is much increased, and its warmth well sustained.

Hip-joint Symptoms; Joint Disease suspected, the real Cause being Cerebral.

Here is a case where the indications were more precise. A young lady aged seven, in August, 1861, being then and previously in good health, was residing at the sea-side, and, after playing and amusing herself during several hours upon the beach on a bright sunny day, had a sudden chill, then became hot and feverish, had violent headache accompanied by great heat of head, and for a day or two was delirious. She was confined to her bed from ten to fourteen days, when, on attempting to walk, it was discovered that she was lame in the right leg, and that she could neither bear any great weight upon it, nor control and direct its movements with force or precision. I will not go over the long particulars of this case. I was desired to examine it in reference to the question of hip-joint disease. There was no indication of it as far as I could detect; no local heat at all; no pain upon carefully manipulating the hip-joint; no special local tenderness upon applying pressure below Poupart's ligament over the hip-joint, where there is always a degree of more or less tenderness, especially in children, this being a rather sensitive part. There was no indication of anything wrong in the hip. This child was treated by tonics. On January 6th, 1862, the patient walked into my room, in every respect improved—less lame, the limb being increased in size, and

* Cases (akin to those of which Mr. Hilton is speaking) where a lower extremity is affected with infantile paralysis are occasionally thought to be due to hip-joint disease. On the diagnosis between the two, Mr. Holmes (System of Surgery, vol. v. p. 848) speaks as follows:—"The hip-joint is less easily under observation, and the morbid sensibility which accompanies some of these cases of paralysis gives more resemblance to hip disease on first handling the limb; but the distinction is usually easy to make. Paralysis generally affects a great part or the whole of the lower limb; hip disease only causes loss of movement of the part affected. In the former, passive motion is easy and causes no pain, or not more than any other motion; in the latter, the joint is stiff, and an attempt to move it causes acute suffering; finally, in paralysis there is no wasting of the buttock unless the whole limb is wasted, nor is the position of the trochanter ever altered."—[Ed.]

maintaining its temperature nearly as well as its fellow. On June 4th, 1862, I had the following note:—"The patient is now greatly improved."

Case of a Curved Sacrum causing some of the "Outlying Symptoms" of Hip-joint Disease.

Here is another case where hip-joint disease was simulated by a structural disturbance which had taken place in the sacrum, or the last lumbar vertebra. The history of the case is briefly this:—T. J. H——, aged nine, residing at Gillingham, Kent, was admitted into Luke ward on the 29th of September, 1859, under my care. He was supposed to be suffering from long-standing disease of the left hip-joint. His mother gave us a history of his having had measles four years ago, and that since that time his left leg had always been weaker than the right. Twelve months after this he fell from a wall six feet high upon his left knee, which became much swollen and very painful, and it continued to pain him for some time. Soon after this the hip-joint of the same side was supposed to have become affected, causing him to walk with difficulty, and to rest on the right leg to ease his left hip. A short time after the pain of the hip commenced, he observed that the left leg was becoming contracted and shorter than the right, so that when he stood upright he rested with the great toe only of his left foot upon the ground. He came under my care three years after he had had the fall from the wall. His left leg was about half an inch shorter than the right. The muscles of the two limbs were nearly equally developed. Looking at him from behind, a slight curve of the spinous processes of the sacrum was visible, its convexity encroaching upon the right ilium, and lifting the posterior portion of the ilium upwards. On looking at the front, and placing a piece of tape across the abdomen from one anterior superior spinous process to the other, the left was proved to be about half an inch the higher. By carefully measuring with a piece of tape the distance from the anterior superior spinous process of the ilium to the inner ankle of the suspected side, and comparing it with the other, it appeared that they were each of the same length. There was nothing wrong to be detected in the hip-joint itself, which I examined with care. As there was no definite remedy to be adopted in this case, the patient was sent away from the hospital in the condition which you see represented in the two drawings (Figs. 85 and 86) placed before you.

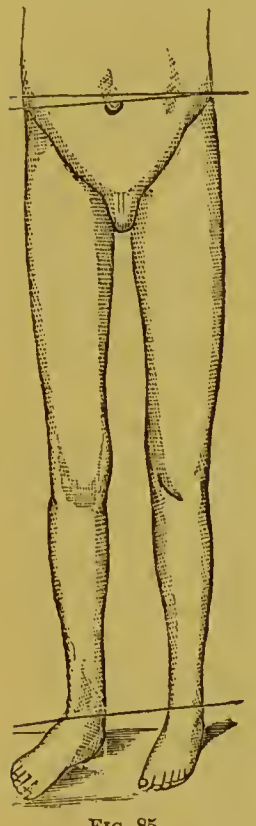


Fig. 85.



Fig. 86.

Malposition of both Hip-joints—Congenital.

There are other kinds of cases which simulate hip-joint or spinal disease; one of these is certainly that of congenital malposition of the hip-

joint. Such cases are rare—at least as far as I know. I have here sketches (Figs. 87 and 88) of two patients, both presenting congenital malpositions of the hip-joints, which are situated posterior to their normal or natural position; and this abnormal position necessitates, that the erect position may be maintained, a remarkably curved condition of the spine. This curve of the spine, and the growth and direction of the shoulders and head backwards are for the purpose of bringing the weight of the head and chest and shoulders over the hip-joints, which are placed behind their natural position; in fact, the spine is curved in order to counterpoise the malposition of the hip-joints. This instance (Fig. 87) came under my notice on the 25th of May, 1852. I had never seen a case like it before. She was then four years old. Her gait was very extraordinary, utterly unlike the awkward modes of progression which we see dependent upon disease of the hip-joint or spine, the shoulders and body being turned backwards. The case was thought to be one of diseased hip-joint, or of curved spine, requiring some remedy to be employed. It seemed to be, however, a case of malposition of the hip-joints. Not being certain of the matter, I requested the advice of Sir B. Brodie, whose experience I thought might help me. We took the patient up to his house, and he said, "I think I have seen a case exactly like it. I remember observing a lady in society who walked very much as this child walks, and I determined, if the opportunity should offer, to ascertain the cause of so peculiar a walk. After a time she consulted me with regard to some disease of the breast, and I then took the liberty of inquiring what was the cause of her peculiar gait. It turned out to be exactly this kind of case—a malposition of the hip-joints posterior to their natural position; and the curve of the spine was simply compensatory." The mother of this child asked us this very proper question: "Suppose my child grows up and is married, will this interfere at all with pregnancy or parturition?" Sir Benjamin Brodie said, "The only answer I can give is, that this lady had had one child: that is my sole experience in the matter." That, I believe, was considered satisfactory by the mother. The child is reported to me as growing up in perfectly good health, but retaining her remarkable gait.



Fig. 87.

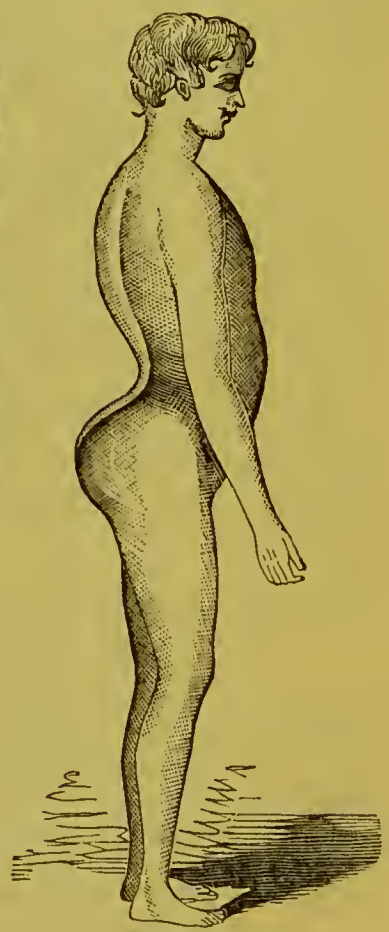


Fig. 88.

I saw this patient again in July, 1862. She was in excellent health. The same characteristic gait was observable, and the same deformities exist. Her stature is short for her age, but she is otherwise well developed.

On mentioning this case to my surgical class at Guy's Hospital, one of the students said, "A friend of mine has a case of this kind now under a surgeon who attends particularly to spinal affections. Whenever the spinal apparatus is put upon the child for the purpose of straightening the spine, it throws the child's head and shoulders so far forwards that the child falls down, being utterly unable to walk." The child was afterwards brought to me with the spinal apparatus on. This turned out to be a case of congenitally malplaced hip-joints. Of course no spinal treatment could cure a case of that kind. It would be in opposition to Nature, and, as a rule, Nature beats the surgeon. The mechanical means employed were here obviously useless, and after a time, by my advice, the spinal apparatus was given up. The child now runs about with the peculiar gait (see Fig. 88).

Some time ago, happening to be in a surgical-instrument maker's room, he told me of his want of success in treating a case of anterior curvature of the spine. By his request I looked at the child; it had the peculiar and characteristic gait of malplaced hip-joints, and the curved spine was compensatory to the *error loci* of the hip-joint. The real cause of the deformity had been overlooked, and no further attempt was made to correct the curved spine.

A fourth case has come under my notice of congenital dislocation of the hip-joints. I was asked to see this by a consulting surgeon in the West-end of London. In this case a medical man had, for no less than two years, been using spinal apparatus and futile manipulations of the hips.

Congenital Deficiency of Development of one Lower Extremity, resulting in its being Shorter than its Fellow.

As I am now bringing before your notice the diagnosis of hip-joint disease, I would next advert to a condition which is often overlooked, and which simulates disease of the hip-joint, in some cases by inducing lameness, in others by causing lateral curvature of the spine, marked by a want of symmetry in the height of the two shoulders. The explanation of the above lies in a want of due and symmetrical development of the two lower limbs as regards their length, a fact which can only be recognized by careful measurements. I may add that I have seen so many of these cases, that I am persuaded that they occur not infrequently, and that they are usually overlooked. Thus I have seen many patients wearing spinal supports, in order to correct a lateral curvature, when the deformity might have, and has been subsequently, corrected by placing within the shoe or boot a piece of cork thick enough to compensate for the shortness of the less developed limb. Half an inch, or indeed a quarter of an inch, of difference in the length of the two limbs is quite sufficient to generate some of the outlying symptoms of hip disease, viz. a limp, and also pain (which is usually felt in the hip) after fatiguing exercise.

The following is a case in point. About eighteen years ago I was consulted by an anxious mother who had noticed for some time a little limp or lameness in her daughter's walking, and had recently observed that her left shoulder was a little lower than the right. This want of

symmetry in the two shoulders had been rendered more conspicuous by the child's lately wearing a silk dress with stripes aeross the back, the stripes now dipping on one side.

By a surgeon and instrument-maker it had been stated that the spine was affeeted, and that some mechanical support was required. As this method of treatment was objected to, I was consulted. Nothing wrong with the spine eould be detected, but, on measuring the length of the two lower limbs, I found that the left was nearly half an ineh the shorter of the two. The patient having been made to stand upright and barefooted, thin pamphlets, one over the other, were placed beneath the left foot until the left shoulder assumed its proper level. The thickness of the pamphlets required to make up for the deficieney in length of the left limb, and to bring the shoulders level, was just upon half an inch. A cork sole of the same thickness was placed inside the shoe, the want of symmetry of the shoulders disappeared at once, and has not returned, the same method of treatment having been eontinuously employed.

In the next case, the fact that one limb was originally half an ineh shorter than its fellow seems to be the explanation of the commencing actual hip-joint disease, which apparently began in the strain thrown upon this joint in unlimited walking. A. W., aged thirteen, notieed pain in the *right* knee in the spring of 1875, at first only after long walks, but subsequently the pain became eontinuous. When I was eonsulted in January, 1876, I found that the *left* leg was half an inch shorter than the right. On account of the symptoms of commencing disease in the right hip-joint, viz. pain, increased temperature, &c., I advised that a splint should be applied, and the patient kept lying down. After awhile, when the above symptoms had disappeared, she was permitted to go about wearing a cork sole on the left foot. There has since been no return of the pain; in fact, in the words of Mr. A. R. Martin, the medieal attendant, the patient may be considered cured.

Diseases of the Sacro-iliac Joint and the neighboring Bones.

Before leaving the neighborhood of the hip-joint, I would direet your attention to some cases of disease of the sacro-iliac articulation. Such eases are sometimes mistaken for hip-joint disease. The diagram (Fig. 58, page 183) will remind you of the powerful ligaments which hold the sacrum in its due relation to the os innominatum on each side; strong ligamentous tissues are interposed between the lateral aspect of the sacrum and the inner and posterior part of the os innominatum. It is impossible to look at the form of the sacrum—its wedge shape, the broad or massive part of the wedge being above—or to regard the extent of the articular surfaces of these bones, and the strong ligaments which fix them together, without perceiving that great strength is a part of their natural function. If any disease should occur at the sacro-iliac joint, I think it will be apparent what the symptoms would be. If a patient should have disease there, he could not sit very comfortably even on the sound side, because then the whole of the weight of the body would be transferred through the medium of the spine to the sacrum, and thence produce pressure upon the artieular structures of the joint, which would, if diseased, induce pain. Nor could the patient stand upright without great pain. Remembering the relations of nerves to that joint, one would say that saero-iliac disease might manifest itself by pain, taking the eourse of the distribution of the obturator nerve, whieh passes just over the front of

the joint. (Vide Fig. 39, page 124.) The great sciatic nerve might, from its closer proximity to the joint, and its sending nerves to it, induce remote symptoms of pain in the hip- or in the knee-joint, or the back part of the calf. There is also the superior gluteal nerve lying close to this joint, which supplies the deep glutei muscles and the tensor vaginæ femoris, and that nerve might lead to spasm or wasting of those muscles. The psoas magnus is lying close at hand, and, under the influence of irritation, it would be in a constant state of contraction, producing a flexed condition of the thigh. Thus we might have a flexed state of hip-joint or thigh, inability to stand upon the limb, or to sit with comfort, pain in the knee, pain in the leg, wasting of the gluteal region, or flattening of the muscles (these are the outlying symptoms of hip-joint disease), these symptoms depending entirely upon the disease of the sacro-iliac articulation.

I think it will be almost impossible, however, to indicate with precision in the living body any marked diagnostic symptoms between disease which may show itself between the fifth lumbar vertebra and the sacrum, and between the sacrum and the upper part of the os innominatum in some cases. If we were to treat this question with a skeleton only before us, we might presume that the local symptoms would be precise enough; but when these deep parts are clothed with soft structures, there is a great difficulty in making an exact pressure, as, for example, upon the upper part of the sacro-iliac joint so as to isolate it from the sacrum, or the sacrum from the last lumbar vertebra. Hence it will be necessary for me, in treating this part of my subject, to group together the morbid conditions of this neighborhood. I shall endeavor to point out the distinguishing marks; but for all practical purposes we might identify them all as forming a little group.

Case of Disease of the last Lumbar Vertebra simulating Hip-joint Disease.

On the 28th of January, 1860, by a physician's request, a little child was brought to me, supposed to be suffering from diseased hip-joint. The physician sent this note with the patient: "The little child I send to you came before me for supposed disease of the back, but it seems to me to be an affection of the hip-joint. I have, therefore, advised the friends to take your opinion." The patient, a delicate child, had had a most severe pain in the region of the left hip for a week before I saw her. She could neither sleep nor bear any weight upon the left limb. She had pain in the hip, knee, and thigh, was very lame, and suffered intensely upon making any attempt to walk. Considerable constitutional disturbance prevailed. On examination I found the hip-joint free from pain; that is, on movement of the hip-joint—isolated movement—the patient experienced no pain, nor was there the slightest evidence of any local heat at the hip-joint. Although there was no pain in the left hip-joint, she presented all the "outlying symptoms" of disease in that joint—lameness, pain in the knee and hip, thigh a little advanced, intense pain in the hip on striking the sole of the foot with the hand, and flattening of the nates on the left side. But on pressing the os innominatum towards the sacrum she complained bitterly. The same thing occurred on making pressure upon the last lumbar vertebra and upper part of the sacrum. There was also pain on deep pressure towards the posterior and superior part of the sacro-iliac articulation. Some increase of heat was to be felt in this

neighborhood by placing the palm of the hand upon it, and by comparing the temperature of the corresponding parts on the opposite side. Thus the case was made out to be disease between the lower lumbar vertebra, sacrum, and ilium. On seeking for a cause of this local disease (it only came out upon subsequent inquiry), it was remembered that about six weeks before the lameness she had fallen upon the ice, but the fall produced no urgent symptom beyond temporary lameness. Spine disease seldom manifests itself only on one side in children, so I was disposed to attribute the mischief to the upper part of the sacro-iliac symphysis. The case was to be treated simply by mechanical rest, and the only way of securing rest to these parts is by the patient lying down uninterruptedly. This plan was carried out. The constitutional disturbance subsided in a fortnight. In two months, in direct opposition to my previous strongly expressed wishes (as she appeared to be in every respect so well), she was allowed by her parents to get up and walk about, and soon afterwards unmeasured exercise was taken.

In a few weeks the lameness and all the other untoward symptoms were again apparent, with occasional shivering. These symptoms continued uncontrolled, and she was allowed to be moving about the house until she was brought to me in the early part of June, 1860. She was then accompanied by the family surgeon, who said he was excessively sorry to see these nice quiet people, good patients, and so on, so distressed about their poor scrofulous little child, with a diseased spine, and a large abscess forming; adding confidentially to myself, that although the case was utterly hopeless as regards the treatment, still he thought it right to bring the case for me to see, as I had seen it before. An abscess could now be distinctly felt, deeply seated upon the inner and posterior part of the ilium, on its pelvic aspect, near the sacrum and last lumbar vertebra; and there was some increase of heat and abnormal firmness of the surrounding soft parts. A hemlock poultice with bread was ordered to be applied over the abscess, and the recumbent supine position to be again resumed, and continued without intermission. The mother was now willing to carry out this plan of "rest" carefully, and for any extent of time. The child was to take the air daily, weather permitting, in a little four-wheeled carriage. The diet was to be good, but not stimulating. It was intended that the patient should go to the sea-side for the remainder of the summer, but some domestic circumstances interfered with this arrangement, and she was kept at home in the country. The abscess opened of itself in September, near the posterior part of the crest of the ilium. It broke in the night, and nearly a quart of matter came away, soaking through the blanket and mattress; and abundant pus, serum, shreds of lymph, and more solid caseous material were discharged. The health remained good. The abscess gradually ceased to secrete, and I saw the patient in January, 1861, well.

Now, here is a child suffering severely as regards health, kept lying in bed, securing the parts from disturbance, and, after seven months' persistent rest in the recumbent position, her health has gradually improved; and the expression that her health remained perfectly good is not exaggerated. The abscess by degrees ceased to secrete, and when I saw her in January, 1861 (up to which time she had been lying down), she could stand up and walk without pain. She was fat, plump, and in every respect well, except that there was a little weeping of thin fluid from the mouth of the sinus of the abscess; there was no pain anywhere. The fourth and fifth lumbar vertebræ seem firmly consolidated, and do not

yield like the other vertebræ on bending the spine. The discharge ceased in February, 1861, when she was brought to me, at my request. She is now, and has been since January, 1861, in good health. The last lumbar vertebra projects backwards a little, but not abruptly. She runs about with the other children, up and down stairs, and stoops to pick up anything off the floor. Sept. 9th, 1862.—The mother writes to me thus: "You will be pleased to hear that my little daughter is quite well, and has not felt the slightest return of her weakness." This presents a case, then, of diseased spine putting on the symptoms of hip-joint disease, with extensive suppuration. The child was thought to be scrofulous both by parents and by the surgeon in attendance; but, in spite of that, the child is now perfectly well, without a single drawback. In addition, I think it shows conclusively the value of mechanical rest in the treatment of cases of this kind.

Severe Disease of Spine, close to Pelvis, cured by Rest.

In the summer of 1851, Miss A—— fell down some steps and bruised her back in the lumbar region. This was soon followed by pain and some tenderness at the part, as well as some pain in the legs. The pain and weakness in the back increased, with some loss of power in the lower extremities, accompanied by a marked inability to sit up long, or to go up and down stairs, the pain in the legs being very severe. She consulted several London surgeons and physicians, all of whom advised tonic plans of treatment, change of air, exercise, and counter-irritation. One surgeon treated her most energetically for neuralgia. These varied kinds of treatment were pursued with irregularity, and without any benefit to the patient, up to the time when I saw this lady in 1854, nearly three years from the beginning of her symptoms. She was then emaciated and weak, had a frequent and irritating cough, with hectic and distressed expression and rapid pulse; also her health was reported to me as very greatly deteriorated, and still getting worse. She could walk but a very short distance, and that with difficulty. She had pains and cramps, and diminished sensibility in both legs, and she could not stand upright without support; both legs were somewhat wasted. The fourth and fifth lumbar vertebræ were painful on pressure, and slightly projecting backwards; pressure upon them producing a severe pricking sensation down the left leg, in the course of the branches of the anterior crural nerve. Deep in the loin on the right side the fluctuation of an abscess could be detected, extending towards the crest of the right ilium. The abscess was opened; her health gave way, and she really appeared to be on the very verge of the grave. I then had her placed on one of Alderman's beds, and removed in an invalid carriage to Brighton. She remained on the couch uninterruptedly, never quitting it, except for the purposes of personal cleanliness, during five months, and then she was lifted horizontally off the bed on to a couch or sofa, and put back when the bed was ready for her. Her health gradually and quickly improved; and at the expiration of a few months all the pain in both legs, and the pricking sensation in the left, had disappeared, and both legs were improved in size and power. She continued recumbent until the discharge had ceased, and all the wounds had healed. At the expiration of fifteen months she could stand upright without pain, and, after a few days' trial, with confidence in herself. Taking walking exercise with crutches, she gradually got well. When last I saw this patient she was in perfectly good health, with not a single drawback in respect to her condition.

This case, then, shows the value of rest. I am quite confident that had not the patient been compelled to lie down, and had not great care been taken of her, she would have died.

Case of Disease between the Sacrum and Ilium, with intense Pain in the Leg on the same side of the Body.

This case is of much interest—in one respect especially, because I was enabled by the recognition of the course of the nerves to the leg to ascertain the real character of the case, the true position of the cause of the symptoms, and thence to deduce the proper plan of treatment. The details are not very long.

On November 23rd, 1861, I was requested to see, with Mr. Barnes, of Chelsea, a young gentleman who was suffering, and had been suffering for some considerable time, from intense pain in the calf of his right leg. The thigh was slightly flexed, and he was unable to walk or stand upon the limb. He was sitting upon a couch, the limb every now and then jumping involuntarily, causing him to cry out with pain. This occurred several times while I was in the room. He had shockingly bad nights. I requested that I might have all the possible details of the history before making any examination. It appeared that on April 24th, 1860, the lad slipped down two stairs, and struck the lower part of his back, but no direct injury was suspected. He soon became lame in the right leg, and, in attempting to walk, his foot turned somewhat inwards. He continued lame and weak in the right leg for nearly three months, after which time he gradually resumed the natural occupations of his period of life. He had repeated attacks of lameness arising from slight casual accidents. In February, 1861, whilst bowling his hoop, he trod unexpectedly, and with force, upon a stone, and sprained his foot; and from that time he became again very lame, and went about on crutches. In the early part of October, 1861, he had a third slip and fall; and from that time he could not stand or move about without pain in his right leg below the knee, with cramps in the calf of that leg. During six weeks the pain in his leg was very great day and night, depriving him of sleep, and distressing his general health very much. He was lifted off his bed and carried to the house of a consulting hospital surgeon, who, seeing him suffering from so much pain and tenderness in his leg, which made it almost impossible to examine the limb carefully, from the additional pain and spasm which were induced by it, and finding nothing wrong about the knee or hip-joint, came to the conclusion that probably there might be deep abscess near the back part of the tibia, and that the tibia itself might be diseased. He directed the treatment to be adapted to such a view of the case, and ordered a belladonna plaster to cover the leg. The night following this visit to the surgeon was passed in greatly increased pain, with cramps and twitching in the right limb. After ten days, there being no alleviation of the severe symptoms, the opinion of another hospital surgeon was sought. He saw the patient in bed, and examined him carefully; but I believe he gave no intelligible or satisfactory opinion as to the cause of the painful symptoms. He directed the patient to be kept quiet on a couch or bed, the knee-joint and leg to be supported by a splint, and the knee to be covered with cotton wool.

I hope this statement will not imply anything like self-laudation. I only mention the facts in detail for the purpose of pointing out the method of proceeding which led to a right interpretation of the symptoms.

No improvement occurring, I was desired to see this suffering patient,

and I went to him with the expectation of doubtful benefit to be derived from my examination, considering the eminence of the two surgeons who had preceded me, and from whose suggestions no good had been derived. I found a very intelligent lad sitting upon a sofa, with his right leg lying on its outer side, supported by pillows. The pulse quickened, but with little febrile excitement; the tongue was not much furred; the thigh slightly flexed, and not to be straightened without pain. There was most severe pain in the leg, which was every now and then, at two or three minutes' interval, suddenly and intensely increased so as to make him cry out. The back part of the calf of the leg was very sensitive, both on superficial and deep pressure, the muscles of the part being in a state of sthenic contraction and quivering, but there was no marked increase of temperature at the part, nor any distinct fluctuation. By steady and continued pressure upon the calf of the leg, the pain was not increased, and I thought the spasmodic condition of the muscles seemed to subside.

These local symptoms, with their natural suggestions, excluded anything like local disease in the neighborhood of the posterior part of the tibia, or within the calf of the leg, where the pain was expressed. The muscles subsided in their spasmodic action, the pain was relieved rather than otherwise by pressure, and there was no increased heat at the part; no pain in the knee or hip-joint when the examination was confined to either of them, nor was there any heat over or near them. On pressing the right trochanter major, he experienced pain somewhere in the hip—not in the hip-joint. No attempt was made to put him upon his legs, because he could not bear any weight upon his right leg, and recent experience had shown that the pain had been greatly aggravated by making such an attempt. I thought it was clear that the real pathological cause of the pain was not at the part wherein the pain was expressed, and that there was no local inflammation in the part; for there was not the local indication or constant concomitant of it—namely, increase of temperature. The nervous supply to the deep and superficial muscles of the leg, and to the overlying skin, being derived from the great sciatic nerve, suggested to my mind the belief that the cause, whatever it might be, would be found anatomically associated with that nerve, to the exclusion of the anterior crural and obturator nerves.

These considerations induced me to examine the structures near to which the great sciatic nerve travels towards its distribution. The patient being gently turned over on his stomach, I pressed with my thumb upon the junction of the sacrum with the ilium, and near to the last lumbar vertebra, on the right side, and he immediately screamed out that I gave him the pain in his leg. On making a like degree of local pressure on the corresponding part on the opposite side, no pain was induced at the point of pressure or in the leg; by repeating the pressure on the right side the pain in his leg recurred. Thus the real cause seemed to be discovered in the form of disease between the sacrum and ilium, or thereabouts; and the obvious and first remedy was to give rest to the joint. That could be obtained only by the patient lying flat upon the back uninterruptedly, and by the application of a long straight splint to the leg and pelvis, so as to prevent any disturbance; the recumbent and supine position to be strictly maintained during two months. The splint was applied immediately by Mr. Barnes. He had no medicine—not a drop. The patient was not allowed to turn in his bed, or to sit up for any purpose; and in a fortnight all the painful symptoms had subsided, so that he was quite comfortable in every respect.

I did not see this patient again until two months after my previous visit. I found him happy, free from pain, health and appetite good, complaining only of a little headache from his head being too low. I turned him on to his left side, and examined his right sacro-iliac joint by direct pressure; but it did not produce any pain, either at the part or in the leg. Thus mechanical rest had aided Nature to repair the mischief, whatever it might have been. Considering that he had been more or less lame since April, 1860, it seemed unreasonable to suppose that the diseased structure of the sacro-iliac joint could be repaired in so short a time as two months; hence it was arranged that the same plan of mechanical rest should be persevered in for one or two months longer.

The diagnosis, in this case, was established chiefly through the medium of a recognition of the anatomical course of the great sciatic nerve which supplied the part where the pain and spasm were expressed. In that respect the case is important and of striking interest. The patient's health, I am happy to say, was in the end perfectly restored.

LECTURE XVII.

Sacro-Iliac Disease in a Boy aged Five, cured by Mechanical Rest—Sacro-Iliac Disease in a Man of Forty-two, cured by Rest—Sacro-Iliac Disease in the Left Side after Parturition; Suppuration within the Pelvis, Abscess Absorbed, cured by Rest—Disease of the Sacro-coccygeal Joint, from Injury, cured by Rest—Inflammation of the Coccygeal Joints, from Injury, cured by Rest—Pain in the Posterior Portion of the Coccyx in Hysterical Cases, Explanation of—Case of Non-Development of both Patellæ up to the Age of Three and a Half Years—Disease of Knee-Joint (Scrofulous?) Treated by Mechanical Rest, cured by Firm Bony Consolidation—Diseased Knee-Joint, from Injury, with Partial Caries or Necrosis of the Patella, cured by Rest—Traumatic Dislocation of the Tibia, treated by Rest and Application of Cold—Wounds Penetrating the Knee-Joint treated by Cold and Rest—Disease between the Shaft and Lower Epiphysis of the Femur—Disease of Knee-Joint; Biceps Divided and Limb Straightened—Old Disease of Knee-Joint; Flexors Divided—Treatment of Loose Cartilage in Knee-Joint by Rest.

In my last lecture I alluded to cases of disease occurring between the sacrum and the ilium, and I mentioned two or three instances which were cured by rest. I shall now detail some similar cases, not only because they are comparatively rare, but because the real seat of disease is so frequently overlooked; while, if the diagnosis be once correctly made, the treatment is exceedingly simple. All this is in accordance with the general impression in the profession, that nine-tenths of our success in practice depends upon accurate diagnosis. Some surgeons are disposed to think that acute or chronic diseases between the sacrum and the ilium, if of a serious character, are almost incurable, and are hence disposed to pay but little attention to their treatment, except in palliation of the symptoms. I think we have clear clinical and pathological evidence that they are actually curable by the employment of proper means.

Sacro-iliac Disease in a Boy aged five, cured by Mechanical Rest.

For the purpose of showing that these cases occur at all ages, and in both sexes, I shall have occasion first to allude to a young gentleman whom I saw on October 29th, 1853, with Mr. Taylor, of the Kent Road. The child was then five years old. He had been increasingly lame in the left leg for about a month, from some obscure cause. He was suffering from much constitutional disturbance, rested badly at night, and was unable to sit, walk, or stand without pain in his left leg. Up to the time of my visit he had been allowed to move about as well as he could, having been treated medically since the first appearance of his symptoms. His left thigh was a little flexed, the body somewhat bent forwards, and he could not bear any weight on that side. The case, then, might be one of hip, spine, sacro-iliac, or possibly cerebral disease. On placing him in the recumbent position upon his back, it became evident, by carefully manip-

ulating the hip-joint alone, that there was nothing wrong about it. The spine presented nothing abnormal on direct pressure nor in appearance; but, on striking the sole of the foot upwards, he had pain in the neighborhood of his left hip. Pressing the left os innominatum towards the sacrum, or pressing the sacrum itself forwards, and exerting, with the thumb, defined pressure over the posterior part of the left sacro-iliac articulation, gave him considerable pain. Thus the case seemed to be made out to be disease between the sacrum and ilium. Nothing wrong was detected in the abdomen. On inquiry, it was thought possible that some local injury, which would explain his symptoms, might have originated in a fall which the little patient had whilst trying to drag a branch off a tree, some short time before the lameness manifested itself.

A belladonna plaster spread upon leather was placed upon his back and hip, and it was arranged that he was not to move from his recumbent position for any purpose whatever. With that understanding, neither splint nor mechanical appliance was made use of. Simple means were employed to keep the bowels relieved, and he was ordered to take syrup of sarsaparilla and lime-water. After lying down a month, his general health had recovered itself, and he was nearly free from pain; but he was not allowed to get up before the expiration of three months, when he was in every respect well and free from pain and lameness. For some time afterwards proper care was observed as to the amount of exercise permitted. I wrote to Mr. Taylor in April, 1860, to ask him about the case, and he replied, "The recumbent position was enforced strictly for three months, and the boy has perfectly recovered—and, I would add, by rest." I do not know whether this last remark is to be considered only as a complimentary expression to myself, but those are the words he used.

In this kind of case there is no rest to be obtained for the sacro-iliac joint except by placing the patient in a recumbent position. Whether sitting or standing, under any circumstances the weight of the head, neck, shoulders, and chest must all be transferred through the medium of the spine to the base of the sacrum, and the sacrum will have a constant tendency to wedge its way between the ossa innominata, and press upon those structures which constitute the soft part of the sacro-iliac synchondrosis.

Case of Sacro-iliac Disease in a Man aged forty-two, cured by Mechanical Rest.

Wm. F——, aged forty-two, a carman, came under my care at Guy's in December, 1857. Six months previously he began to suffer pain, as he said, in and about his "left hip." His occupation rendered it frequently necessary for him to lift heavy weights, and he thought he might have strained the parts in some way, although he could not definitely fix the time or manner of the accident. The pain, which was at first only intermittent and comparatively slight (coming on only after exertion), gradually became constant and severe. Lifting weights became impossible to him, and at last he could not bear his own weight, and walking caused excruciating pain, which he described as "running down to the upper part of the thigh." Before admission into Guy's he had been treated for rheumatism, sciatica, and hip-joint disease. On admission, it was found, by careful examination, that the seat of the greatest pain corresponded

with the right sacro-iliac synchondrosis. Pressure upon the sacrum or ilium in such direction as to disturb the sacro-iliac synchondrosis gave rise to great pain, as did also pressure applied directly over the joint between the sacrum and the os innominatum. On the other hand, the pelvis being steadied, the hip-joint could be moved about and manipulated in any way without producing pain, so long as the movement did not affect the sacro-iliac synchondrosis. At times there was pain about the gluteal region; there was never pain in or about the knee. The patient could not lie on his right side without pain, was unable to stand or to walk without very great pain, and the attempt to stand produced yielding in the lower part of the back; but there was neither shortening nor lengthening of the limb, nor any marked alteration in the contour of the gluteal region. The patient had had neither shivering nor any other symptoms of irritative fever. He was ordered to keep his bed, and remain absolutely at rest upon his back. I will not trouble you with the minor details. About two months afterwards, in February, 1858, he was furnished with a strong pelvic belt of leather, provided with buckles and straps, and so contrived and padded as firmly to embrace and steady the pelvic bones, and prevent, as far as possible, movement of the sacro-iliac joint. The patient remained recumbent in bed until the beginning of April (four months), when he was permitted to sit up in bed, which he did without pain. In a few days he got up (wearing the belt), walked slowly about with the aid of a stick, and with scarcely any pain at all. From this time he steadily improved, and at the expiration of five months he left the hospital, returning to his occupation three weeks afterwards. The time spent in rest was therefore six months. I requested the patient to call upon me in 1861, and he did so in March. He could then carry two cwt. without difficulty, and had done so during the last two years, but he still laid great store by the pelvic leather belt, which gave him more comfort and a greater sense of security than anything else, and the tighter it was strapped the more comfortable it was to him.

This man presented clear evidence that he had disease between the sacrum and the ilium, from which he had suffered during six months previously to my seeing him. He was perfectly cured by six months' rest. The whole of the good effected was by keeping the pelvis in repose—not interfering with the natural efforts towards repair, which were ultimately made with success. The advantage of the circular belt no doubt consisted in its maintaining the diseased parts in forced coaptation, for I believe the man has now anchylosis between the sacrum and the ilium.

Sacro-iliac Disease in the Left Side after Parturition; Suppuration within the Pelvis; Abscess absorbed; cured by Mechanical Rest.*

In 1853 I saw a lady, aged twenty-four. After a tedious and severe, but natural labor, she had been delivered on April 17th, 1853, of a healthy and strong child. She remained in bed, and everything went on well for two or three weeks, when, on moving abruptly in bed and turning quickly on her side, she felt pain for the first time in her left hip. It was not then

*A somewhat similar case of sacro-iliac disease, where the patient "had been delivered with great difficulty of a very large child," is mentioned by Professor Esmarch in his monograph on Cold, translated in the series of the New Syd. Soc. for 1861.—[Ed.]

severe, but gradually increased in severity, particularly on attempting to stand or walk. She had at the same time obstinate constipation of the bowels. She continued lame, suffering from pain in the hip and on the inner side of the knee, restless nights, with profuse perspiration, and depressed general health. She took quinine, sulphuric acid, and other tonics, and had a belladonna plaster applied to the gluteal region. On June 25th, seven weeks after her confinement, I saw this lady, in consultation with Mr. Sinclair, of Halstead. There was some difficulty in making out the seat of the disease. I found her reclining with her right side upon a couch, to and from which she was carried by her husband, as she could neither stand nor walk without pain in the left hip-joint and knee. The left limb was shorter than the right, because the leg could not be perfectly straightened, and the thigh was a little bent upon the abdomen and slightly adducted. (These are very much the outlying symptoms of hip-joint disease.) She was really in extremely bad health; her nights were sleepless, her appetite gone, she was always in pain, with symptoms of commencing hectic. On attempting to stand, it was impossible for her to bear the slightest weight on the left leg without agonizing pain. The buttock was flattened on the left side, and when the sole of the foot was struck she had intense pain in the left side of the pelvis and in the left hip-joint. On grasping the lower limb, and being careful not to disturb the pelvis, but to limit the movement to the hip-joint, no pain was experienced in it by flexion, rotation inwards or outwards, nor on pressure in front of the joint; at least, there was not more tenderness than is usual in that situation. It was plain, therefore, that the hip-joint must be excluded from suspicion. On pressing the ossa innominata towards each other, thus compressing the sacro-iliac articulation, the pain in that joint and the hip and knee on the left side was excessive; and on examining the back, and pressing upon the posterior part of the left sacro-iliac joint, great pain was felt near the point of pressure. On accurately measuring the two limbs, it was shown that the apparent shortening of the leg depended on the slight elevation of the left side of the pelvis. On passing the finger into the rectum, to ascertain the cause of the constipation, and to discover if any local mischief existed there, it reached a fluctuating swelling towards the left sacro-iliac joint, and pressure upon the supposed abscess gave severe pain through that joint.

The case seemed now to be clearly made out to be disease in the left sacro-iliac articulation, with abscess within the pelvis, originating in parturition; the treatment indicated was evidently *rest* to the sacro-iliac articulation, and that could only be accomplished by a persistently recumbent position. She was placed upon a hair mattress, and a large belladonna plaster, spread upon a thick leather, was applied so as to cover and support the whole of the pelvis posteriorly and laterally, including the hip-joints. She was not allowed to move from her position in bed and upon her back for any purpose. Some saline febrifuge was to be taken daily; and nothing else but plain food; no stimulants.

On July 4th I saw this patient again; she was cheerful, and in every respect better. Quinine and iron were now ordered; opium to relieve pain, and chloroform liniment to be rubbed over the gluteal region and knee; the belladonna plaster to be continued to the back of the pelvis.

August 20th.—The general and local improvement has continued, and the fluctuation within the pelvis is not so prominent; the left leg is now straight, and lies flat upon the bed by the side of the other leg. A pelvic circular belt was applied, and constantly worn.

It was plain that this lady had a long illness before her. As she had been of extremely delicate health at all times, as her residence at that time was by a river-side and damp, and as winter was approaching, it was thought better to send her to Brighton. She was taken there to lodgings opposite the sea, without being moved from the horizontal position. She returned from Brighton in October, 1854, quite well; indeed, she had been so for some considerable time previously.

In the spring of 1855 she was able to take any reasonable walking exercise without pain or inconvenience, and was considered cured of her sacro-iliac disease; she has remained in that respect quite well. I might add that the abscess entirely disappeared. She never passed any purulent fluid from the rectum; hence we may infer that the abscess was absorbed. Several superficial abscesses formed in the left leg below the knee, and were opened, giving issue to unhealthy pus. I think it is in accordance with the experience of most surgeons, that when purulent absorption has taken place, if the person be not very healthy, the secondary abscesses, which may perhaps be the consequence of that absorption, have, generally speaking, unhealthy and offensive pus within them. I have noticed it repeatedly; and it becomes a happy provision on the part of Nature when she selects those parts of the body where the secondary abscess may be comparatively harmless.

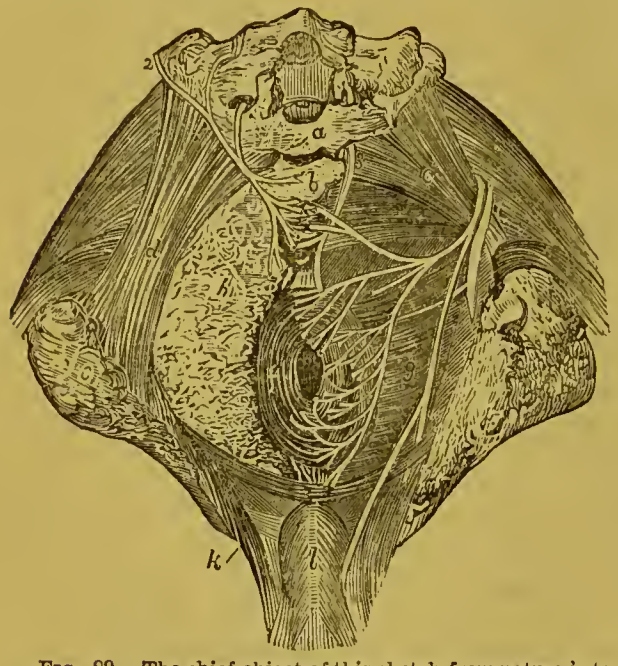


FIG. 89.—The chief object of this sketch from nature is to indicate the numerous nerves (of sensation) which are distributed over the coccyx and to the lower part of the rectum, as well as to the margin of the anal aperture. *a*, Sacrum. *b*, Coccyx. c, Tuberosity of ischium. *d*, Greater sacro-sciatic ligament. *e*, Lesser sacro-sciatic ligament, with pudic nerve lying upon its posterior aspect. *f*, Sphincter, and circular fibres of rectum. *g*, Levator ani. *h*, Fatty and areolar tissue. *i*, Transversus perinæi. *k*, Erector penis. *l*, Accelerator urinæ. No. 1, Pudic nerve crossing anterior sacro-sciatic ligament, and dividing into branches, some to the sphincter ani and lower part of the rectum, part of which perforate the muscular fibres in order to reach the mucous membrane of the rectum; others to the muscles seen in the fore part of the sketch. No. 2, Posterior branches of the second, third and fourth sacral nerves proceeding to the posterior aspect of the coccyx. No. 3, Sacro-coccygeal nerve distributed over the apex of the coccyx and adjacent soft parts.

This lady wore a belt embracing the pelvis during nearly the whole period of her residence at Brighton, and took cod-liver oil and steel wine somewhat irregularly. The only therapeutic agent efficiently employed was local mechanical rest to the sacro-iliac synchrondrosis, and that principle was most completely and satisfactorily carried out. Since that time she has had no children.

In the following year she had disease in her right knee-joint, which became much swollen. She thought it was brought on by trying to save the left leg in walking. This was a tedious thing, but she got over it by applying a splint to the joint, and so giving it rest, and by spending a summer in Wales. In January, 1861, I saw her again. She was in excellent health; indeed, I never saw her looking so well.

These are all the cases of sacro-iliac disease which I think it necessary to adduce (they are not all which I might have placed before you) to show

how this disease may be diagnosed; and that, when once clearly diagnosed, the treatment is one of extreme simplicity. We must give rest to the joint by the recumbent position, and aid anchylosis through the medium of close coaptation of the opposite surfaces of the bones by a pelvic belt.

Before quitting the neighborhood of the pelvis, I would make a few remarks on some cases of disease of the sacro-coccygeal articulation; but first let me refer you to this diagram, showing the sacral nerves passing over the posterior surface of the sacrum, and spreading their branches over the lower part of the sacrum and coccyx (Fig. 89).

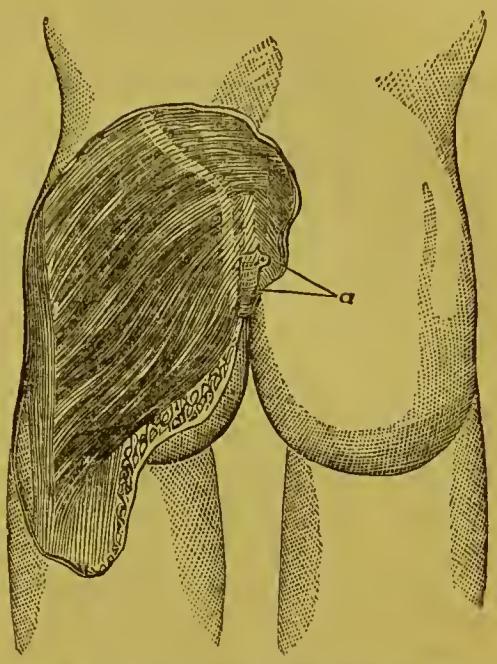


FIG. 90.—This sketch is introduced merely to point out the attachments of the gluteus maximus to the coccyx, and to indicate that any contraction of this muscle might and would disturb the coccyx and sacro-coccygeal joint.

In the sketch (Fig. 90) you may see the attachment of the gluteus maximus to the coccyx. It must be obvious that if the sacro-coccygeal joint or the coccyx itself be inflamed, and the gluteus maximus be used to any extent in the act of elevating the body from the sitting posture, or in sitting down, or in rapid progression, the coccyx or sacro-coccygeal articulation must be much disturbed. Hence, although the patient may be able to walk gently, slowly, and carefully, yet, on attempting to stride out, he suffers considerable pain from the disturbing influence of the gluteus maximus. Then notice the muscular association of the posterior part of the external sphincter of the anus in this drawing (Fig. 89, *f*); its fixed point is at the apex of the coccyx. During defecation, and subsequently, these muscles contracting towards their more fixed points would tend to disturb or displace the coccyx, and pull it away from the sacrum. Some of the symptoms of which such patients generally complain are thus explained.

Disease of the Sacro-coccygeal Joint, from Injury; cured by Rest.

I saw the young woman, to whose case I am about to refer, on the 2nd of April, 1860, and she gave me this history. Ten months before she fell upon the corner of a chair, which struck the coccyx forcibly, and gave her much pain. She had pain on defecation, on attempting to rise from a seat, little pain in walking slowly and carefully, but she could not run or walk rapidly, and she experienced great pain in going up-stairs or upon sitting down.

On examination, the coccyx was found to be turned forwards almost at a right angle with the last bone of the sacrum, and to encroach upon the rectum. The joint between those two bones was swollen, and very painful on pressure. The coccyx was tender along its whole length, and pressure at its free end caused pain at the sacro-coccygeal articulation.

For treatment, she was directed to lie down as much as possible, to take the twentieth of a grain of bichloride of mercury, and a drachm each

of tincture of rhubarb and tincture of bark two or three times a day, and to keep the intestinal evacuations soft with confection of senna.

She continued lying down until April 20th (eighteen days), when I saw her again, and she was in every respect better. She then went home to lie down a month longer. After the lapse of that time she was so much relieved from all her symptoms that she began slowly to resume her duties of attending upon an invalid lady—a case of diseased spine.

In July, 1860, I saw this person again. Anchylosis had taken place between the coccyx and sacrum, and she suffered no important inconvenience unless she happened to sit abruptly upon a hard flat surface; then the angle of union between the coccyx and sacrum was painful. The pointed end of the coccyx annoyed the rectum somewhat, but she was getting accustomed to that. In 1861 she remained well, could take any amount of exercise, and suffered no pain during defecation.

Here, then, is a case of disease of the sacro-coccygeal joint, and the appropriate method of securing rest requires to be considered in reference to the treatment. The objects to be attained are, to avoid the action of the gluteus maximus upon the joint, to avoid sitting upon the coccyx, to avoid any extreme action on the part of the sphincter, and to take care that no great amount of expulsive force shall be required for the purpose of defecation. The motions should be kept soft, and the patient should therefore take a large amount of fluid nourishment, which is readily absorbed, and leaves very little fecal residue. These are the chief indications in the treatment of such cases, and they all relate to the subject of mechanical rest, the securing of which is the secret of the successful issue of these cases.

Inflammation of the Coccygeal Joints, from Injury; cured by Rest.

The last case of this kind to which I shall allude is the following:—In consultation with the late Mr. Duchesne, I saw a young lady, aged sixteen, in the summer of 1852. She had slipped down the steps of the doorway during the frost of the preceding winter. She fell upon the gluteal region, but said she did not strike herself where she subsequently felt the local pain. Soon afterwards she had pain in defecation, in assuming the erect posture, and in attempting to walk. At the period of the accident she was in every respect in good health; but since that time—about six months—she had suffered so much from pain, constipated bowels, and loss of appetite, as to render her general health anything but good, and she had lately been losing flesh. Her easiest posture was the recumbent, and the plan of lying down had been occasionally adopted, with benefit, as a part of her treatment, up to the time of my seeing her. I need not trouble you with many details. The whole length of the coccyx was tender to the touch; the different portions of it were pliant and movable upon each other, but painful; indeed, the whole of this bone was in a state of slight inflammation. The patient was placed in a recumbent position upon a hair mattress, and not allowed to get up at all during the first eight weeks. At the expiration of that time it was found that nearly all the local symptoms had disappeared. She then took gentle, limited, and carefully watched exercise (partly at the sea-side), and ultimately got quite well. I saw her father on February 25th, 1860, and he reported to me that his daughter had been, and was then, quite well, except a slight disposition to be constipated.

I had intended, if this patient had not been relieved by rest, to have

put a bistoury under the skin and cellular tissue, and detached the external sphincter from the coccyx. I did this operation some years ago in the case of an hospital patient, who had suffered from the same kind of injury and had the same local symptoms. The operation was followed by a slight suppuration on the pelvic side of the coccyx, but it ultimately led to the cure of the patient. I think it right, however, to add, that I have since that time seen several such cases, quite as severe, which have done well by time, and perseverance in the method of treatment by rest alone.

Surgeons are consulted by persons who have great pain and tenderness in walking, some pain in defecation and in sitting, and pain about the posterior part of the coccyx. This kind of case occurs more especially in "hysterical" women. I have seen many cases of this kind. The coccyx is very tender on its surface, and sometimes exquisitely sensitive to the touch; but there is one very notable circumstance,—namely, the entire absence of any increased heat in the part, the want of that local indication which is always positive as regards the existence of inflammation. Such patients scarcely ever, or rarely, receive any benefit from remaining in the recumbent position. The explanation of the symptoms is this:—You will remember that there are numerous sacral nerves spread over the posterior surface of the sacrum and coccyx, and that they are in intimate structural communication with the anterior sacral nerves, which join with the hypogastric plexus of the sympathetic within the pelvis, and thence proceed to the uterus and ovaries. There is pain and sensitiveness in the skin and over the sacrum and coccyx, difficulty in walking, and some trouble in defecation; but no evidence of an inflammatory condition. If the finger be put into the rectum, and the coccyx grasped between it and the thumb, the coccyx will move backwards and forwards without pain. These, then, are "hysterical" affections, and are to be treated in reference to such an interpretation.

I now leave the neighborhood of the pelvis, and proceed to the knee-joint, for the purpose of considering the value and true relation of "mechanical rest" as a remedy in the injuries and diseases of that joint. But first I would solicit your attention to an interesting case of non-development of the patellæ until three and a half years of age.

Case of Non-development of both Patellæ up to the age of three and a half years.

This child (a female) was born in 1835, at the full period of gestation —the mother says with one leg turned upwards, so as to rest upon the chest, where an indentation existed, and an abscess subsequently formed. There had been no deformity in any of the mother's previous or subsequent children. I saw the child at Guy's when she was three months old. Her legs below the knee could be manipulated into any position, backwards, forwards, or laterally, without pain. She could flex the legs completely. No patella or distinct ligamentum patellæ could, after most careful examination, be discovered by the surgeons to the hospital, or by myself, in either knee. Subsequently Sir Astley Cooper examined this child's knees, with the same result; but he assured the mother that her daughter would walk well after a few years, for he had seen a similar case, and the child ultimately walked well. He had a drawing made of the patient by Canton in 1836, with the feet, or one foot, turned upwards. It would be an interesting drawing to obtain. I have explored the College collection of the drawings bought of the late Mr. Bransby Cooper, but

I cannot find it there. This child came before me again when she was about twenty-two months old. I happened to see her in a farm-house, and thought it most extraordinary to meet with two such cases within two years; but it turned out to be the same child. There were no patellæ at that time—not a rudiment to be felt; and I saw the child walking about the room, bearing its weight upon the condyles of the thigh-bones, with the legs turned forwards, the feet in the air, the soles of the feet presenting directly upwards, and the child hugging one foot, and sucking one of its own great toes. The mother assured me that the child used to go to sleep in that way. She could not stand upright by herself on her feet, but moved about upon the posterior surface of the condyles of the thigh-bones. I advised the parents to place forms around the room, so that she might rest her hands upon them, and in that way begin to employ the legs as organs of support and progression. This plan was carried out, and the child was not allowed to walk as hitherto, nor to pull her legs directly upwards towards the face, which she was very fond of doing. The legs were from this time kept quite straight when in bed or lying down. When three and a half years old she had no patellæ, but at about four years very small ones, like peas, manifested themselves, resting in a rudimentary ligamentum patellæ, which Mr. Owen, of Finchinfield, then or soon afterwards recognized.* From that time she began to be safer on her legs, and when she was about five years old she could walk, supporting herself by two short walking-sticks. Afterwards she walked increasingly well, but not safely; for the legs used frequently to give way under her, and she would fall down. At between six and seven years of age I examined the patient. She could walk uprightly, but not with perfect steadiness. Each patella was about the size of the rounded end of an adult's little finger, and both joints were very loose, and yielded to lateral displacement much more than they should have done naturally. She remained at home until she was sixteen, and it was not until she was ten or eleven years old that she appeared firm upon her legs. I saw her in January, 1862. She is short in stature, capable of walking any reasonable distance, and is upon her feet the greater part of the day. The patellæ are small, but well shaped and in good position; indeed, on looking at the knees, nothing peculiar presents itself, but she says that if she suddenly comes down upon her feet a little on one side, she is apt to fall. I saw nothing peculiar in her manner of walking when in my room.

Here is a case, then, where "mechanical rest" was the starting-point of the freedom of a patient from ulterior deformity. If she had been allowed to go on walking upon the condyles of the femur, it would have necessarily followed that the strong crucial and lateral ligaments, employed to maintain the bones in their normal relation to each other, and to oppose inordinate muscular force, must have been so stretched that it would have been a matter of impossibility to render the joint serviceable in maintaining the erect posture, or in aiding progression.

It is worthy of remark how long a time is required for the repair by anchylosis of serious or severe disease of the knee-joint; but we cannot be surprised at that circumstance when we recollect the large number of soft tissues which have first to be destroyed by disease, then absorbed by

* A rudimentary patella has been noticed at the third month; it remains cartilaginous up to about the third year, when ossification commences usually by a single nucleus. To meet the increasing strain upon the bone, ossification should be complete about puberty.—[Ed.]

Nature or discharged by natural suppuration, in addition to the dense articular laminæ of the bones themselves. It is true that in young persons reparation and growth are very active, so far, perhaps, forming a happy compensation for the frequency of disease of this joint at that period; but it is impossible that all the articular structures can be disposed of, and bony anchylosis supervene, except by the lapse of a considerable length of time. Surgeons ought to intimate this to the friends of the young patient, so that the consequent delay in the cure may not take them by surprise.

Disease of Knee-joint (Scrofulous?) treated by Mechanical Rest; cured by firm Bony Consolidation.

F. L—— was nine years of age when I saw him. His knee commenced swelling without obvious cause and without much pain; for a few days lotions and poultices were applied, and he was kept in bed. After two months of treatment, as he was not only not improving, but the pain, tenderness, and swelling were increasing, Mr. Robertson, of Chatham, brought him to me in March, 1852. He was then wasted, and in very bad health; he suffered from loss of appetite and sleep, was generally feverish and thirsty, with a rapid pulse. The knee was a good specimen of what might be termed scrofulous white swelling. All the tissues of the joint were swollen, soft, and yielding; heat of the joint increased; no redness of skin; some fluid within the joint; no rough pressure or movement of the joint could be borne; the knee was flexed, and could not be straightened without inducing extreme pain. His father had a portion of deal gouged out so as to make a deep trough, in which the child's leg was placed. The edges of the trough were higher than the prominence of the patella; the two long bones forming the joint were kept straight, and the edges of the splint prevented the bed-clothes from touching the leg at night. Steady pressure upon the joint, by strapping it with soap plaster, and perfect rest to the joint by the splint, with attention to his general health, were continued during several months, when, finding the joint diminished in size, less painful, and still slightly movable, a thick leathern splint was made to embrace the upper two-thirds of the leg (the knee only laterally and posteriorly) and the lower half of the thigh, so as to oppose the flexors (the biceps especially), which were gradually and slowly displacing the tibia backwards and outwards. This leathern splint he wore nearly five years, the latter part of the time at night only. For sixteen months he was not allowed to make the slightest attempt to bear any weight upon his leg. He was carried about in the arms of his mother, or placed in a little carriage, and drawn out



FIG. 91.—F. L——, aged nineteen. *aa* indicate merely the sites of the former sinuses (associated with the abscesses), and long since healthily closed up. The right leg is about an inch and a quarter shorter than the left; the right patella is smaller than the left, and the right foot is not so fully developed as the left.

daily when the weather permitted. Then he began to get about very cautiously on crutches. His general health was very bad, but the knee was diminishing in size. From that time the limb became more sightly and more useful. He was taken into Wales to the seaside, and he had all the advantages that good air, domestic comfort, and extreme care against injury could provide. After staying there some months he was brought to town by sea, and I then saw him. There was obviously defined fluctuation above the knee, as well as in the popliteal region; the patella was firmly fixed to the front of the femur, and the tibia was partly united to the condyles. The abscesses did not communicate with each other, so far as could be ascertained. His health was better than formerly, but he was still very feeble and delicate-looking. I thought it better to defer opening the abscesses, in consequence of his depressed health, and the repair of the joint not being as yet perfect. He returned by sea to Pembroke for the winter, and in a few months the popliteal abscess broke, and the one above the patella was opened by the surgeon as soon as the skin covering the abscess became very thin. The purulent discharge was not excessive, the walls of the abscess did not inflame, and the joint remained free from further implication. In the spring his health had much improved, and the discharge from the sinuses soon ceased. Finding he could bear some weight on his leg without pain, he took (with his crutches) a gradually increasing extent of exercise during the next two years, when the crutches and leathern splint were put aside. He was then slightly lame in consequence of the knee being a little bent, and the leg below the knee not being quite so well developed as on the sound side. No doubt he had a long illness, but ultimately his leg reached the condition represented in this drawing, which was made on the 20th of June, 1861. In April, 1861, the report respecting him is this: "He is now in his nineteenth year, can take almost any amount of walking exercise, enters into the sports of his college, plays at cricket, is strong, and pulls well in a boat. The knee is firmly anchylosed, his general health excellent, and his lameness scarcely perceptible." By such careful but simple management, and the use of the leathern splints (which he regards as a sort of trophy, and says he will never part with), he ultimately recovered.

Diseased Knee-joint, from Injury, with partial Caries or Necrosis of the Patella; cured by Mechanical Rest.

The next case is one of diseased knee-joint, depending upon, or associated with, necrosis of the patella. Surgeons will admit that disease of the interior of the knee-joint, connected with a necrosed or carious condition of the patella, usually involves a considerable amount of risk to the joint. Of the few cases of this kind which I have seen, amputation has been required in order to save the patient's life in three instances.

This young gentleman, J. M——, aged six years, a highly strumous lad, although of healthy parents, fell upon some pebbles or gravel, and struck his knee-joint, in the early part of May, 1857. He was afterwards seen by Mr. Lovell, of Chelmsford, who found the knee much inflamed, and directed that it should be kept quiet, and some spirit lotions applied to it. I saw him on the 17th of June, 1857. He then had suppuration external to the knee-joint, and effusion of inflammatory fluid into the interior of the joint. He had strumous ophthalmia, some ulcers upon the cornea and at the margins of the eyelids, and his general health was exceedingly bad.

Here was an important and serious complication of an external abscess connected with disease of the patella and effusion into the interior of the knee-joint. There was no apparent fluctuation between these two collections of fluid, the one being external, and the other internal. Having made out with sufficient distinctness that they did not communicate, I opened the external abscess on the front of the joint, letting out between two and three ounces of unhealthy pus. I passed a probe carefully towards the patella, and there felt a necrosed or carious condition of the bone.

The removal of the fluid from the abscess rendered the fluctuation within the knee-joint more apparent, and the whole of the joint was hot, swollen, and painful, requiring great gentleness in moving the limb. A short, thick, leathern splint was applied to the back of the lower half of the thigh and upper half of the leg below the knee. The splint was worn day and night, with a small poultice to the wound. The general treatment consisted first of alkalies and bitters, and subsequently of steel wine and cod-liver oil, together with good diet and good air. He wore the splint uninterruptedly during eleven weeks. The abscess was slow in healing; exuberant granulations were projecting from the wound over the patella, suggesting the persistence of some deep-seated local irritation—probably unhealthy bone. These granulations were kept down to the skin-level by nitrate of silver. The pain, heat, fluctuation, swelling, and puffiness of the joint gradually subsided, and in a few more months he could walk about without difficulty, but with the joint still a little swollen.

In March, 1858, he had a second fall upon the same knee, which brought on fresh subacute or chronic inflammatory action within the joint, associated with much constitutional disturbance. Soon after this period I saw him again; the knee had become flexed, and the tibia showed a tendency to become dislocated backwards and outwards. An extended straight splint of thick leather was now employed, embracing the leg and thigh, so as absolutely to prevent flexion of the joint or displacement of the tibia and fibula backwards, and to keep the whole joint at "rest." Horseshoe-shaped blisters were applied over the joint repeatedly, and this plan of blistering was continued until the end of June, when the local indications of mischief had much subsided; but there remained a general thickening, and some heat about the joint. He was taken to the sea-side, where he remained till the middle of October. At that time I again saw him. All the joint symptoms had nearly disappeared. The splint had been worn uninterruptedly; but from this time it was kept on at night only. From this period the use of the splint was gradually diminished, and moderate exercise, slowly increased, but always short of inducing pain or increased heat in the joint, was permitted.

On March 17th, 1861, the surgeon says, "I have examined the knee to-day. He can do anything he likes with it, and can move it in any direction. There is no deformity of the joint. The patella is, perhaps, not quite so freely movable, in consequence of the scar of your lancet, half an inch in length, at the lower part of the patella, which remains, and is the only vestige of former disease. This has 'puckered in' the surrounding skin, and is adherent to the bone. He has been well these two years. He walked with his knee stiff for some time, but gradually got the free use of it. I look upon his recovery as an extraordinary one. I used to think if he got off with a stiff joint he would be very fortunate; for, if you remember, the head of the tibia was inclined to be displaced

backwards. But here he is, and to see him walk you would imagine that he never could have had the serious disease of the knee-joint he had."

This patient certainly did present the appearance of what is termed a scrofulous and strumous constitution, as evidenced by his bad general health, enlarged glands in his neck, and ulceration of the cornea and eyelids. I might add to these facts by noting that the disease of the patella was brought on by a comparatively slight accident. Yet he is now perfectly well. It is probable that small portions of carious bone may have been extruded with the purulent discharge, but none have been seen.

The next case to which I will allude is

A Case of Traumatic Dislocation of the Tibia forwards and outwards, treated by Rest and the persistent Application of Cold.

It is to this latter circumstance I would take the liberty to direct your earnest attention, because I feel certain, from experience, that we do not make proper and sufficient use of the local application of cold in order to prevent the occurrence of inflammation after local injury, or to subdue it when it may have supervened.

On the patient's admission, October 29th, 1858, he was found to have a fracture of the left radius at its middle third, and a dislocation of the left tibia forwards and outwards. There was an abnormal and marked prominence at the anterior and outer part of the left knee, caused by the projection forward of the head of the tibia; the concavity of its upper surface could be distinctly made out through the integuments. The patella and its ligament were inclined obliquely forwards, and the extensor muscles were quite lax; upon the back of the limb could be seen and felt the two rounded prominences of the condyles of the femur, and the tendons of the flexors (especially the biceps) formed tense cords on the lateral surfaces. Slight ecchymosis existed on the outer and lower parts of the thigh, and the injured limb was somewhat shorter than the other. Chloroform having been administered, the muscles became relaxed; extension and counter-extension were effected upon the thigh and displaced tibia; by the employment of but little force the tibia returned into its right position, accompanied by a slight snap, and the limb at once resumed its natural appearance. A common wooden splint was put upon the back of the limb, reaching from the foot to the middle of the thigh. A bladder containing ice was constantly applied to the knee for seventeen days and nights without intermission, in order to keep down the temperature of the knee, the result of which was that during this period no symptom of local inflammation was observed. On November 26th the patient had gone on so well that the splint was removed; but as it was found that an unnatural extent of lateral movement could still be made to occur at the knee-joint, indicating defective crucial and lateral ligaments, the limb was put up in a starch bandage. The patient suffered little or no pain in his knee, nor was there any constitutional disturbance, although the local injury to the interior of the joint must have been very severe. The only local application was ice; the only medicines, slight aperients occasionally, and ten grains of Dover's powder to procure sleep. He got quickly well.

This man had dislocation of the tibia, and must have torn all the internal and most of the external ligaments of the joint. During seventeen days and nights the joint was never allowed to get warm, and he had not a single bad symptom, except on one occasion, when, for the purpose of

observation, the application of the ice was left off for a few hours, and then the joint began to get hot and painful.

Permit me to add another case illustrative of the good effect of the local application of cold in preventing the occurrence of inflammation after a wound in the knee-joint.

A young man came into Guy's having received, a few hours before, an incised wound, nearly three inches long, penetrating into the anterior and outer part of his knee-joint. The limb was put upon a long straight wooden splint, and, thus supported, the foot and knee were elevated, so as to relax the extensors and facilitate the return of venous blood from the limb. The coarse edges of the wound were nicely adjusted by fine superficial sutures, and the only local application was iced water by irrigation, by dropping cold water during twenty-three or twenty four days and nights. The patient had not one bad symptom, except when we took away the cold irrigation by way of experiment, and then he began almost immediately to experience pain, heat, and more swelling within the joint. He finally got perfectly well, the joint completely recovering itself without permanent defect or injury of any kind.

I cite these two cases, but I could add many more, in order to prove the right value of the local application of cold as a most potent, and therefore valuable, agent in preventing or controlling inflammation after traumatic injury. The cold should be applied with a spirit of defiance to the inflammatory condition, and a fixed determination not to permit its occurrence. I feel confident, from what I have seen in private and hospital practice, that if we could only make proper use of cold locally in cases of accident or injury, and employ it efficiently—that is, continuously and of sufficiently low temperature to keep the injured part cool, or free from heat—we should find it eminently serviceable. This I do know, that the way in in which we now apply cold lotions is absolutely ridiculous, and often futile. If you order a cold lotion to be applied to the seat of local injury for the purpose of keeping down the temperature of the part, in ten minutes it becomes warm, and so it continues till the nurse chooses to renew its application. By this method of proceeding the true advantage to be derived from cold cannot be obtained. Cold applied locally is a most potent remedy, acting powerfully and vigorously upon the nervous system, as well as upon the capillary and larger blood-vessels, and I must add that, as a rule, it is most unphysiologically and feebly employed in this country.*

I have here a case of traumatic injury to the knee-joint, on which I must dwell for a few minutes.

Lacerated and contused Wound laying open the Knee-joint; Suppuration within and around the Joint; Portions of the Articular Surface of the Bones extruded; Anchylosis of the Joint; Limb fixed in a good position by the aid of a firm wooden Splint, to insure for it Mechanical Rest.

William K——, engineer, aged eighteen, a strong healthy-looking youth, whose leg had been caught in the machinery of a steamer near Dover, was admitted into Guy's Hospital on October 28th, 1861 (sixteen hours after the accident), with an extensive lacerated and bruised wound

* See the monograph of Professor Esmarch on the use of cold in surgery referred to above, note, p. 250.—[Ed.]

over the inner condyle of the left femur. Some portion of the integument had been partially torn off. The wound passed under the integument into the interior of the knee-joint. The edges of the wound were brought together by pins and figure-of-8 suture; the limb was slightly flexed; ice was constantly applied over the whole of the joint, which was swollen and hot. Low diet was ordered, and aperients administered.

October 29th.—The knee is very much swollen, and, in spite of the continued application of large bags of ice, its temperature continues very high. Bowels opened; pulse 90 to 100.

30th.—The joint is very hot and painful, with much effusion within it. Patient gets no sleep. Pulse 90, full; tongue furred. Pins taken out; wound suppurating. Two grains of opium at night.

31st.—Patient is flushed; pulse 100, full. Ice to be discontinued, and warm poppy fomentations applied to the knee, and the limb to be placed on a splint. The bowels being costive, aperients were ordered.

November 2nd.—He is much quieter; the pain is lessened. There is discharge of much healthy pus from the wound. Slept four hours during the night; bowels opened; pulse 90. Ordered full diet. Liston's splint applied.

7th.—Patient is comfortable. The discharge is purulent and profuse. Appetite pretty good.

11th.—Much inflammatory suppuration around the joint; incisions were made above and below the joint to give exit thereto. Ordered wine, &c.

22nd.—Suppuration is extreme, both from within the joint and from the soft parts without. Patient is rapidly emaciating. Several pieces of bone have come away, one of them having a distinct portion of articulating surface upon it.

28th.—Patient does not sleep well, and is getting thinner. Ordered opium every night.

December 1st.—The joint seems thoroughly disorganized. It is being straightened gradually upon a wooden splint.

4th.—Much difficulty is experienced in retaining the limb in a proper position, owing to the tendency of the tibia to be dislocated backwards and outwards.

15th.—It has been necessary to "put up" the limb afresh every two or three days. Dislocation of the tibia is with much difficulty prevented. The plan now adopted seems to answer the purpose. Liston's back splint is applied behind, a short splint on the inner side of the thigh, and a long splint (interrupted opposite the knee), extending from the foot to the armpit, on the outer side of the limb. The discharge is much diminished. Patient feeds and sleeps well; pulse 80.

January 5th, 1862.—Lately there has been an increasing tendency in the tibia to be displaced outwards. Small sand-pads carefully applied over the head of the fibula and bandaged in position, with a short splint over them and the long inside splint, have counteracted this tendency. Patient's condition is improving; the discharge is very slight.

17th.—The knee is in good position. There is a small superficial slough at the outer side of the foot, resulting from the pressure of the splint upon it.

26th.—Wound in the knee nearly healed; foot nearly well.

February 18th.—After four months' rest, the joint seems pretty firmly anchylosed; no pain in it. The patella is fixed to the femur; the joint is returning to its natural size.

March 3rd.—With the exception of an attack of erysipelas near the knee, which fortunately did not affect the new repairing structures, nothing untoward has happened to this patient, who may now be said to be well. The left leg is nearly an inch shorter than the right. This patient left the hospital with a short wooden splint upon the back of the knee, and supporting his weight upon crutches.

Soon after leaving Guy's he fell, and struck and twisted his anchylosed knee. He came again under my care, with pain, heat, and swelling of the knee. A splint was applied to the back of the limb, which was elevated, and ice was constantly applied to the knee, so as to destroy the excess of heat. With these simple means, and rest upon the bed during a month, his knee became free from pain, heat, and swelling; and he again quitted the hospital, capable of bearing some weight upon the limb.

This case does my dresser, Mr. Sergeant, great credit. The patient at one time was desperately ill, and if I had been at all disposed to cut off a limb, I should have seized that occasion as an opportunity for doing it; but I rather preferred watching and admiring the surgical efforts of Nature than any effects of my own interference, and here is a representation of the result. The great difficulty in this case was to prevent displacement of the tibia from the femur. My dresser, Mr. Sergeant, successfully resisted that tendency by the application of splints, and it does him great credit. Here (Fig. 92) is a sketch of the man's limb. The bones are firmly united to each other, and there is no displacement of the tibia laterally or posteriorly. The biceps was our great opponent, and I threatened to cut its tendon asunder; but thinking we might beat it without any cutting, we applied a small firm bag of sand over the head of the fibula and under the side splint, so as to press the tibia inwards, and it succeeded. I verily believe that if the dresser and house surgeon had not been absolutely determined that displacement of the tibia should not occur either backwards or laterally, this man would have had a very deformed and almost useless limb, but he now has one that scarcely offends the eye at all, and which will be a very useful member both for support and progression.



FIG. 92.—Sketch of W. K——'s leg, with anchylosis at the knee-joint, and the limb in good position. *a* points to the position of the cicatrix of the original wound, now well healed up.

I venture to append this further remark: I feel quite confident that provided surgeons will adopt and follow out with inflexible determination this plan of securing "mechanical rest" to inflamed and suppurating joints, they will very seldom see much deformity in such cases, and very rarely be required to excise the joint or amputate the limb.

Injury to the medium of union between the shaft and lower epiphysis of the femur is not very rare; from what I have seen in public and private practice, I think that it is a pathological condition not unfrequently overlooked, the local symptoms being misinterpreted. Any injury to the epiphysis itself, or to the soft tissue uniting it to the shaft of the thigh-bone, requires the aid of mechanical rest for its relief or cure; and here is a case in point.

Disease between the Shaft and Lower Epiphysis of the Femur; Suppuration; Abscesses opened; cured by Rest.

Fanny H——, aged ten years, was admitted into one of my wards on April 13th, 1859. When three years old she had a fall over the end of a bed, which stunned her. When taken up she could not put her right foot to the ground; and the knee became flexed, so that the great toe was two or three inches from the ground. In a short time, however, she became much improved; but her father noticed a slight weakness in her walking. On April 21st her right leg was very slightly shortened, say a quarter of an inch; the knee-joint could be neither extended nor flexed perfectly. There was pain on pressing a spot one inch above the knee-joint both on its outer and inner side; the temperature was much increased at both points, and some swelling existed there. The upper part of the popliteal space was hard, full, hot, and tense; with pain at intervals occurring twice or thrice a day, and lasting about ten minutes. A long straight splint was put on the limb, extending from the axilla to the foot; she was ordered one grain of iodide of potassium with infusion of bark three times a day, and poppy fomentations to the swollen part.

April 23rd.—The long splint could not be borne, and it was removed.

27th.—No improvement. The patient suffers very much. The limb was then placed upon a double inclined iron splint, and swung. Six leeches applied upon each side of the knee. Two grains of mercury with chalk and three grains of Dover's powder to be taken night and morning, and some saline febrifuge during the day. A hemlock poultice was applied over the painful part.

May 9th.—There is distinct fluctuation of an abscess to be felt under the vastus internus, anterior to the tendon of the adductor magnus. An opening was made through the skin and facia lata with a lancet; a grooved director was then pushed through the vastus internus, and formed a guide to the dressing forceps, which were thus introduced into the abscess, from which about two ounces of healthy pus quickly flowed.

June 7th.—A deep sub-muscular abscess was opened on the outer side of the knee, and sixteen days subsequently another opened of itself in the popliteal space.

July 20th.—The leg has been at rest, swinging upon the iron splint, and the knee can now be perfectly straightened without pain. There is no distinct swelling, but a little general thickening of the lower part of the femur immediately above the knee-joint. The wounds have all closed. The iron splint is to be left off, and a firm leathern splint is to be applied, so as to keep the limb straight and the seat of disease undisturbed.

This mechanical support was continued through several weeks, and during that, and for a longer period, she was not allowed to put the foot to the ground in order to bear any weight upon it. She ultimately got quite well, without any untoward symptom.

I have no doubt that this was a case of disease between the shaft and epiphysis of the femur, resulting from injury and inflammation of the soft medium of union between these two portions of the bone. Disease of this part is not, I think, often referred to, but I am convinced that it is not of unfrequent occurrence.

I am anxious to impress upon the profession generally my strong conviction that in all cases of accidental injury or inflammation of the knee-joint, as well as in every disease of this articulation, the knee should be

kept uninterruptedly at rest and straight, until its reparation is complete. I believe that as soon as sufficient importance is given to such views we shall cease to witness those numerous and extraordinary deformities about the knee-joint, resulting entirely from the want of mechanical resistance to that muscular force, which causes so often dislocation of the tibia and fibula outwards and backwards, of which you may find so many specimens in the metropolitan and other pathological museums. A fixed rigid splint will certainly prevent such deformities—I feel positive about it—provided the splint be sufficiently resisting. A gutta-percha splint will not accomplish it, not being sufficiently strong. A firm, padded splint of leather, wood, or iron ought to be placed along the posterior and lateral part of the joint; and I may add that in all such cases it is advisable that the limb be swung, as in cases of fractures of the leg. During many years I have swung nearly all my cases of acute disease of the knee-joint, and I have found it contribute immensely to the comfort of the patient.

Here are two or three cases in illustration of the deformity which ensues from the non-employment of mechanical resistance, to disturbing muscular force, and the method of proceeding to be adopted in order to remedy the deformity which may have occurred.

Case of diseased Knee-joint; the Knee flexed, and the Tibia partially dislocated backwards; the Biceps Tendon divided, and the Limb straightened; cured by Mechanical Rest.

A young woman, J. M——, when she was two years old, had a fall upon her right knee, and suffered afterwards from symptoms of acute inflammation of the joint, followed by contraction of the ham-string muscles, and extreme flexion of the knee. Two abscesses, one in the popliteal region, and one above the knee, were associated with this diseased joint. She was not able to walk without crutches after the accident; very inconvenient instruments were employed for the purpose of putting the leg straight, and she thinks she received more harm than good from their application. On March 29th, 1860, she came under my care in Guy's Hospital; she was then eighteen years old. When standing upon the left leg, the heel of the right foot was between four and five inches above the ground. The patella was fixed firmly by bone to the femur. Chloroform having been given, forcible extension was employed, but we could not straighten the limb; the tendon of the biceps muscle was therefore divided about one inch above the head of the fibula; forcible extension of the knee was continued, and the limb straightened, after which a straight wooden splint was applied to the limb upon its posterior aspect. After the operation, ice in a bag was constantly applied to the knee, in order to prevent the occurrence of any inflammation, and five grains of Dover's powder were ordered to be taken at night. On the 13th of April, within a fortnight of the forcible extension, her leg was straight, and very comfortable. The splint was constantly applied until May 21st, and here is the final result. This drawing (Fig. 93) was made in January, 1862, and accurately represents her present condition. You will observe that the ground-plans of this patient's feet present some notable peculiarities; the right foot is altogether smaller than the left, and its outer portion is but imperfectly developed, whilst the great toe is exceedingly prolonged. This, I apprehend, is owing to the period of life at which this was a comparatively useless foot. The great toe has, however, grown

most extraordinarily since she has been using the limb. You may remember that on a previous occasion (Lecture XIII.) I reminded you that we might divide the foot, anatomically and physiologically, into two longitudinal parts—into the outer or strong part, and the inner or more elastic part, connected, structurally and functionally, with the more advanced period of life, when the foot is required to be in a state of perfection. It seems that this patient formerly used her right foot scarcely at all, and it did not grow with the other foot; but soon after the biceps tendon was divided, and the foot came into active use, the growth of the foot has been something marvellous, and especially on its inner side; hence the prolongation of the great toe seen in the ground-plan. The patient is now about



Fig. 93.



Fig. 94.

twenty years old, and can take a considerable amount of exercise without difficulty.

In this case I did not find it necessary to divide the tendons of the semi-tendinosus or the semi-membranosus muscles; these, after the division of the biceps, yielded to the influence of extension.

Before operating upon the tendon of the biceps muscle, it is necessary to bear in mind, and to ascertain, the exact position of the external popliteal nerve. Previous to the administration of the chloroform, there is usually no difficulty in distinguishing the real characters of the tense cords which you may feel passing along the tightened part of the popliteal region, as we see it when the knee is much bent from old disease of the joint. The nerve may then be recognized by the pain which is induced when pressure is made upon it. Its course being ascertained, the other cords must be the tendons; and further than that, as far as I have observed, upon closely examining the parts, you may trace the individual tendons up towards their respective muscles, and so identify them.

Old-diseased Knee-joint; Knee bent; Tibia displaced backwards; Flexor Tendons divided; treated by "Mechanical Rest."

Martha M——, aged fourteen, was admitted into Guy's Hospital, under my care, in January, 1860, suffering from the effects of old-diseased right knee-joint. The tibia was drawn backwards and upwards, so that she could only just touch the ground with the great toe by inclining the pelvis to that side. At five years old, when quite healthy, she had her knee struck by a little hammer; and it became chronically inflamed. She had no splints; and although she was under constant professional treatment, she continued to get worse during two years, when she was taken to a London hospital, with advanced disease in the knee-joint. She remained there seventeen weeks in bed, and during the latter part of the time she had scarlatina severely. A gutta-percha support was applied to the knee, yet the knee became more and more flexed, so as to form nearly an acute angle with the posterior part of the thigh. The bending of the joint chiefly occurred during the time she had scarlatina. The surgeon proposed to amputate the leg as soon as the health of the patient became good enough, but the parents would not entertain that question; so she was allowed to get about at home on crutches up to the time of her admission into Guy's, with the right leg useless, because the knee was flexed and the tibia displaced backwards, the condyles of the femur projecting forwards. The patella was firmly anchylosed in a good position upon the condyles of the femur; the tibia was movable upon the femur to a slight extent, with membranous anchylosis between the tibia and femur. Chloroform having been administered, the leg was extended, and the tendons of the biceps, semi-tendinosus, semi-membranosus, and gracilis were divided. The leg was forcibly drawn first downwards and then forwards, so as to overcome or correct the deformity resulting from the displacement of the tibia backwards. In this we were only partially successful, although some tearing of the tissues was heard during our efforts at extension. The limb was then bandaged upon a straight splint; the tibia, however, could not be brought to its proper position as regards the femur. In ten days another splint was applied, with a screw attached to it, so that the knee could be gradually extended and the tibia advanced until the limb was nearly in its present condition. She left the hospital eighteen weeks after admission, with the screw splint upon the leg. As soon as it was found that the limb could be maintained in that improved position by the patient, a common leathern splint was applied to it, for the purpose of supporting and defending the joint. This leathern splint was worn day and night for fourteen months, during which time she has walked more or less on the lame leg, gradually increasing the distance, and going to school daily, with her health improving.

Feb. 7th, 1862.—She can walk two miles without pain or much fatigue in the leg; no heat or swelling in the knee. The right leg, properly measured, is quite an inch and a quarter shorter than the left leg; but the pelvis is inclined to the right side, and the spine somewhat curved, thus compensating for the shortening of the right limb, so that when she walks she scarcely appears lame. The right half of the pelvis is half an inch less in circumference than the left. Here is a sketch of the actual state of the patient, and ground-plans of the soles of her feet, clearly indicating a defective development in the right foot as compared with the left.

These are cases, I think, which maintain the conclusion that "physiological rest" (by division of tendons) is an important agent to be employed

in correcting some of the deformities of diseased knee-joints. The deformities, however, might as surely be prevented by the application of splints in the early part of their treatment.

I had intended, if time had permitted, to adduce some facts tending to prove that one kind of loose cartilage may be absorbed from the knee-



Fig. 95.

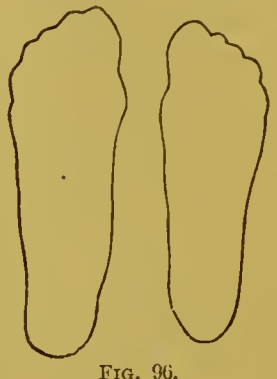


Fig. 96.

joint, by retaining the loose cartilage accurately at rest in contact with the same part of the synovial membrane during several weeks, and employing counter-irritation over it at the same time.*

* In a clinical lecture on loose cartilages in the knee-joint, published in the Guy's Hospital Reports for 1868, Mr. Hilton gives several cases in which a loose cartilage gradually disappeared when kept fixed by strapping, so as to be pressed firmly against the synovial membrane. He concludes by saying, "Synovial membrane is merely a modification of serous membrane, and as such is endowed with secreting and absorbing powers. You must use this latter function in order to get rid of the important disease which is now occupying our attention. How is fluid in a joint absorbed? By the synovial membrane only, and by no other means. With clot in a knee-joint would you open that joint? Certainly not. The clots of blood will undoubtedly be absorbed. Recognize, then, this absorbent power of synovial membranes, and use it in the cure of loose cartilage." For a mention of two other cases treated with complete success, see a short but interesting paper by Mr. Manby in the Birmingham Med. Review, July, 1875.—[Ed.]

LECTURE XVIII.

Strumous Disease of both Elbow-joints; Joints well Anchylosed, but in bad Positions—Disease of the Wrist cured by Rest—Case of Rupture of the Ligamentum Patellæ at the Junction of the Ligament with the Patella—Disease of the Cuboid and Os Calcis; Diseased Bone removed; New Bone formed; Cure aided by "Mechanical Rest"—Disease of the Os Calcis; Bone removed; Bone renewed—Disease of the Epiphysis of the Os Calcis—Distribution of Third and Fourth Cervical and First Dorsal Nerves to Upper Portion of the Chest—Disease of Right Sterno-clavicular Joint, cured by Rest—Suppuration in Left Sterno-clavicular Joint, opened by Ulceration, cured by Rest—Disease of Right Sterno-clavicular Joint, produced by Forcible Traction; Death from Pyæmia—Disease between First and Second Portions of the Sternum, cured by Rest—Effect of Muscular Exhaustion on the Joints of the Foot—Inflammation of Right Ankle-joint and Foot; Suppuration; Dislocation of the Foot; Cured by Rest—Injury to Soft Structure uniting Shaft of the Tibia to its Lower Epiphysis; Ostitis; Sub-periosteal Suppuration; Death in Twelve Days—Conclusion.

In a previous lecture I mentioned that, although some diseased joints may occur in persons of a scrofulous constitution, it does not necessarily follow that the joints cannot repair themselves by time and opportunity. Here is a drawing (Fig. 97) which will portray such joints.

Strumous Disease of both Elbow-joints; Joints well anchylosed, but in bad Positions.

This drawing from nature represents another instance of anchylosis of both elbow-joints, occurring in what is termed a scrofulous youth. In spite of this the elbow-joints are perfectly anchylosed — anchylosed, however, in a very unfortunate position, because he could not feed himself except by bending the head towards the left hand, nor could he dress himself or make any important use of his arms.



Fig. 97.

The following is a brief reference to this case:—W. S—— was fourteen years of age when he became, some years ago, an in-patient of mine at Guy's Hospital. His mother stated that he was always an unhealthy child, and that when four years old he had small-pox, followed by what the doctors called "scrofular abscesses." Disease began simultaneously in both elbow-joints. No splints were applied in order to determine the direction of the forearms, which were allowed to keep in the position represented in the engraving. Several small pieces of bone

had been removed at different periods from both joints. There was no pain in either joint, but some thiekening remained in the surrounding soft struetures. By passing a probe into the opening of a sinus seen upon the right elbow, loose pieees of bone eould be deteeted.

Although a markedly serofulous eonstitution was manifest in this patient, yet in both joints anehylosis had been aeeomplished.

These two drawings (Figs. 98 and 99) show the hand and forearm of a young girl, aged eighteen, who came under my care in 1852, with extensive disease of the carpus and wrist-joint of the right side. The eause of the disease was not known. Suppuration amongst the bones had oeeurred, leaving several diseharging sinuses both on the anterior and posterior aspect of the wrist. It was very painful, and the bones could be made to grate upon eaeh other: a probe detected denuded bone. An hospital surgeon, seeing no probability of saving the arm, had arranged to amputate it in a day or two; but, before doing so, I was consulted, and, as the girl was in tolerable health, I advised her not to submit to the operation. A leathern splint was moulded upon her hand and arm, so as to keep the wrist absolutely at rest. This splint was worn day and night during several months, and she was sent to Margate to reside. The pain and discharge soon diminished, the sinuses closed, and she got well as regards the wrist, exeept that the wrist-joint was anchylosed, so that she could not bend it, but she could move her fingers and thumb with great freedom in 1853, and her eondition at that time is represented roughly in the drawings. The dark patehes seen upon both the anterior and posterior aspeet of the wrist indicate the sites of the former sinuses, now elosed; the skin is healthy and movable upon the subjaeent structures.



Fig. 98.



Fig. 99.

The following is another illustrative case, with a rather eurious history:—I saw a lady four or five years ago who came to me with disease in some of the carpal bones. She had had a ganglion on the baek of her hand over the wrist, and she went to a surgeon to have it eured. He proposed to rupture it by striking it with a hard leathern-bound book, but his arm was not very steady. He tried several times to break or burst this ganglion, by striking it with the baek of the book, but he eould not succeed. At length, however, he gave her hand a tremendous blow with a larger book, which ruptured the ganglion, but the blow led to inflammation amongst the carpal joints. This resulted in suppuration with disease of the earpus, and the proposal of amputation of the forearm. It was then that I saw this lady for the first time, with a painful and swollen wrist and hand. Two sinuses were discharging pus, and a probe introduced into them came in contact with bare bone. A leathern splint was moulded upon the hand and forearm, so as to seeure perfeet rest to the wrist. No more probing of the wound was permitted. She went to Margate, and remained there during several

months; the sinuses closed, and although the wrist is stiff, yet she has a very useful hand.

These are the only references I shall have time to make to disease of the elbow-joint and carpus cured by "rest." But these will be sufficient to intimate the value of "rest" as a therapeutic agent in their treatment.

There is, perhaps, no part of the human body in which the beneficial influence of mechanical rest can be established so perfectly, in so many different ways, and in relation to so many different accidental lesions, as the neighborhood of the knee-joint; so that I could easily extend this subject over two or three lectures, with appropriate illustrative cases; but the only one to which I will now briefly allude is one of forcible separation of the ligamentum patellæ from the patella. This is a comparatively rare accident, and it requires to be treated by absolute rest to the leg; to elevate the leg and foot so as to relax the extensor muscles lying upon the thigh, and at the same time to employ strips of plaster, horseshoe-shaped, to pull the patella downwards towards the detached ligamentum patellæ. A case of this kind was admitted under my care at Guy's Hospital.

Case of Rupture of the Ligamentum Patellæ at the Junction of the Ligament with the Patella.

Robert B——, aged forty, was admitted into Cornelius ward on the 12th of October, 1861, with a good deal of swelling and ecchymosis over the whole of the knee-joint, and complete inability to lift the leg. The account he gave of the accident was, that he was standing on a plank which was suddenly tipped up, and his heel became fixed in a deep groove in the plank. He was thrown with rapidity first forwards and then backwards with great force, whilst his leg was bent under him. He felt something give way at the knee, and from that time he lost the power over his leg. When placed in bed, the patella was found entire, drawn upwards, and unnaturally movable, especially in the long axis of the limb. There was a strongly marked depression immediately below the apex of the patella, into which the finger could be thrust almost to the joint, so that the condyles of the femur could be easily felt; the lower end of the patella could be directed backwards to a great extent, or could be tilted forwards by pressure on its upper edge so as to project the apex under the skin. The limb was extended upon a straight back splint, and placed in an elevated position, so as to relax the extensors of the knee-joint. A lead lotion was applied over the whole of the joint. When the general swelling had subsided, two long pieces of strapping were applied, crossing one another above the patella, so as to draw it downwards, and to keep its apex near the upper part of the ligamentum patellæ.

November 17th.—The patient was allowed to get up, with a short splint extending along the back of the thigh and leg, so as to keep the joint at rest, and to prevent traction upon the ligament.

23rd.—He left the hospital by his own desire, cured so far only that the configuration of the joint was nearly normal, except some fulness, and tenderness on pressure at the junction of the patella with the ligament; and as yet he had not the power to lift the limb by his own efforts. He was ordered to continue the use of the short back splint, and to get about on crutches.

On quitting the hospital, although the union of the patella to its liga-

ment was tolerably good, yet it was not at all equal in strength and firmness to what the patient required of it. He ventured to walk about a great deal too much upon it, and he soon came back to the hospital with the parts inflamed and swollen. Having remained in the hospital at rest upon his bed for a short time, he went out again much improved, with the intimation from me that it would take at least six months before the repair would be complete.

In a former lecture (Lect. XIII.) I adduced several arguments and many facts against scrofula being as frequently the *cause* of diseases in the bones and joints as accidental and local injury. One of the facts which I adduced in support of that opinion was, that in diseases of the tarsus the cuboid bone and the os calcis are more frequently affected than any other. Almost all the weight seems to concentrate itself upon the outer part of the foot; and I apprehend these are some of the reasons why disease of the tarsus occurs so frequently on the outer side. It receives most of the weight of the body, and is thus rendered liable to all accidents associated with that early and indiscreet period of life and of unmeasured exercise—childhood. Now, to give rest to the tarsus it is necessary that the foot should be elevated and freed from any pressure. I may now place this subject practically before you by referring to a case.

Case of Disease of the Cuboid and Os Calcis; Diseased Bone removed; New Bone formed; Cure aided by "Mechanical Rest."

On April 2nd, 1856, a gentleman brought his son to my house suffering from disease of the tarsal bones of his right foot. He had been several months under professional treatment, having abundance of medicine, but allowed to get about at home as well as he could, without giving any decided rest to the foot. The cause of the disease was supposed to be scrofula, brought on by over-exertion, with possibly local injury. When I saw this young gentleman he was eleven years old; not very unhealthy in appearance, but presenting florid cheeks, thick lips, feeble pulse, cold hands and feet, and enlarged tonsils. The whole of the right foot was swollen, especially the outer side corresponding with its tarsal and metatarsal portions. Ulceration, the sequel to an abscess which had opened of itself, existed for about one square inch over the cuboid and its articulations with the os calcis and the two outer metatarsal bones. The surrounding and overlapping skin was dark and congested. Poultices had been continued up to the time of my seeing him. On passing a probe into the wound, bone denuded of periosteum was at once detected, but he would not allow of a close examination of the part; and, as the foot was swollen and inflamed, I thought it better to send him home to Hammersmith, and place him on his bed with his foot and leg elevated, so as to get rid of their congested state.

I saw him again at his home on the 21st of April. His foot had become much smaller and less painful; he had more sleep at night, and suffered less pain: he was already improved by "rest." I might extend my remarks with respect to the elevation of a limb suffering from a state of congestion. It is at least an important point in treatment, which appears to be not sufficiently attended to in practice.

After inhaling chloroform (for he would not allow me to touch him otherwise), I explored the wound; and finding the cuboid necrosed and carious, with disease of its articulations with the os calcis, I removed the loose pieces of bone, leaving the periosteum and the whole of the sur-

rounding opaque soft vascular structures undisturbed. The whole of the cuboid bone and a portion of the os calcis were removed. The excavation was large and deep. He was kept in bed, with his leg raised, until May 9th (five weeks), when his knee was placed upon a wooden leg, with a horizontal rest for his leg, and a footpiece of leather (an important addition to this kind of apparatus), to prevent any accidental injury or disturbance to the foot itself. Two months after his first visit to me I saw him at my house on his way to Margate, much improved both as regards his health and his foot: the wound was quiet, and disposed to close. He had his crutches and wooden leg, which he was to use at all times when moving about, under the supervision of his careful and anxious mother, who was dotingly fond of him, and much alarmed at her son having been thought scrofulous. Iodide of lead ointment was to be applied to the feeble wound, and over that a pad of cotton wool. He remained at Margate until the end of September, 1856. During his stay there, suppuration and ulceration occurred in the sole of the foot, opposite the diseased bones of the dorsum of the foot. He came to me on the 7th of October, 1856, at the end of six months. The ulceration on the dorsum of his foot was nearly closed, but there was still some discharge from the sinus in the sole. Direct pressure made over the site of the cuboid, or through the fourth and fifth metatarsal bones, gave him some pain, and he could not then bear any weight upon the foot. He continued to use his crutches and artificial leg for a year, until April, 1857, when all the parts were healed, with some depression and adhesion of the skin upon the dorsum of the foot over the cuboid. He was then allowed to take careful and well-watched exercise in walking, and he got quite well in every respect, although he was thought to be scrofulous.

Here was a case, then, of disease of the cuboid bone and anterior part of the os calcis undoubtedly relieved through the medium of "mechanical rest."

In the summer of 1859, whilst in a state of somnambulism, he jumped out of his bedroom window, a distance of nearly twenty feet, upon some soft grass in front of the area of the house, where he was found by his father, the marks of both feet being well seen on the ground where he had alighted. His foot suffered no harm beyond a severe strain. He was a good deal shaken by the leap, and was confined to his bed, but soon recovered, and has been well ever since. At my request this patient, with his father, called on me in March, 1861, and I took this note of him:—He is now sixteen, can walk, run, &c., like other active lads, but thinks that his right foot is not quite so strong as the other. The outer side of the right foot is rather shorter than the corresponding part of the left foot. This is well explained by the two outer toes being abruptly shorter on the right than on the left foot.



Fig. 100.

Here are ground-plans of his two feet, roughly taken by myself. Notice the two outer toes of the right foot, which are associated anatomically with the cuboid bone—that bone which I know was diseased, and removed. Their growth has been impeded, and the result is the peculiar configuration of the foot, as regards those two toes which articulate with the cuboid. At the seat of the former disease, the space naturally occupied

by the cuboid bone is now perfectly filled up to its proper level; the skin and subjacent cellular tissue are perfectly healthy; and it appears to me that the metatarsal bones, the new cuboid, and the os calcis are now anchylosed, or blended together; but there is little or no difference in the distance from the posterior end of the os calcis to the base of the fifth metatarsal bone in either foot.

As far as I can interpret this case, the cuboid bone has actually been reproduced. This leads me to remark that surgeons should be very cautious not to disturb unnecessarily the periosteal membrane which they meet with in operations associated with diseased bone. On the contrary, they should be careful to leave all these vascular granulations which surround the diseased bone and line the inner aspect of the periosteum; for I think that experiments, experience, and sound physiology show that, if we can secure these bone-producing vascular structures from local injury, we give Nature a fair chance of manifesting her powers of speedy reproduction or renewal of bone. Thus I believe that the minimum of disturbance which I inflicted upon the periosteum, when I removed the necrosed and carious bone, may have contributed something towards the good result obtained in this case.

Case of Disease of the Os Calcis; Bone removed; Bone renewed.

In 1855 I removed nearly the whole of the os calcis of a young patient by making an incision along the outer and back part of the foot. I took care to leave the periosteum as complete as I could, and not to disturb unnecessarily the surrounding granulating surfaces, and especially to guard against any interference with the epiphysis of the os calcis; and here (Fig. 101) is roughly depicted the condition of the foot some time after the operation. I have seen the patient since that drawing was made: the foot is quite consolidated and healthy, but not so fully developed as on the left side, although there seems to be almost as good an os calcis as in the other foot. It is hard and solid; there is no pain on pressure; and the bone seems to have been perfectly reproduced. If that be true, and the explanation correct, it is another instance of how highly important it is to avoid any interference with the periosteum and other tissues which surround these necrosed or carious portions of bone.



Fig. 101.

Disease of the Epiphysis of the Os Calcis.

I must now allude to a morbid condition which I believe to be not of very rare occurrence, namely, disease of the epiphysis of the os calcis. I have had this drawing made from nature merely for the purpose of reminding anatomists and surgeons of the existence of the epiphysis to the os calcis. Here (Fig. 102) is the foot of a patient thirteen years of age, indicating the precise extent of the epiphysis at that period of life. You see a thin plate of bone surrounded by a temporary cartilage attached to the posterior and inferior part of the os calcis, preparatory, no doubt, to

its fuller development, the epiphysis having relation to the perfection of the foot, giving to it increased leverage, and adding especially to its elasticity. It is worthy of remark that the tendo Achillis is attached exclu-

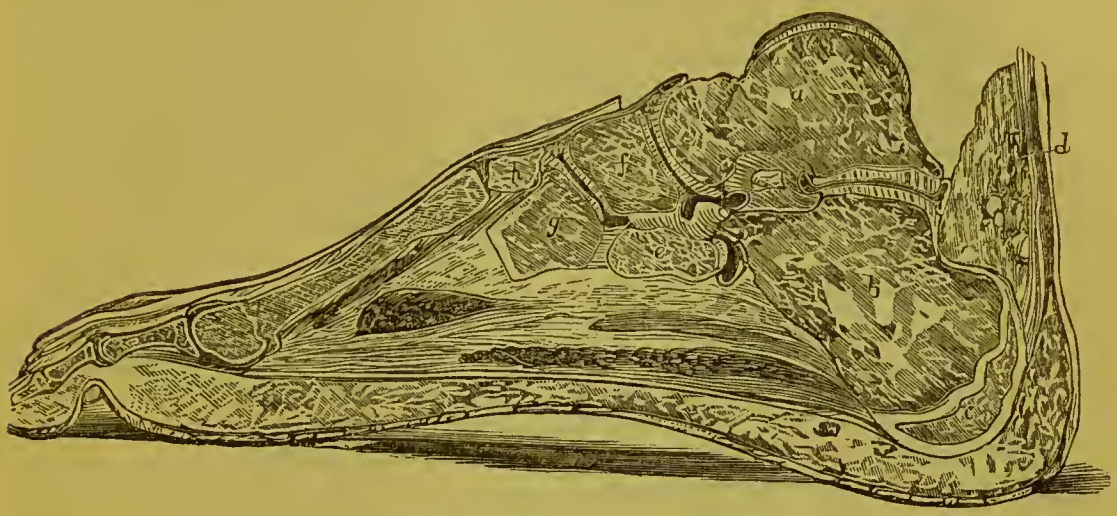


Fig. 102.

The foot from which this drawing of a longitudinal section was taken was that of a patient thirteen years of age, and it marks with precision the actual condition of the epiphysis of the os calcis at that period of life, and in a healthy foot. *a*, Astragalus. *b*. Os calcis. *c*, Epiphysis of os calcis. *d*, Tendo Achillis attached to epiphysis of os calcis, surrounded by temporary cartilage. *e*, Cuboid. Scaphoid. *h g*, Cuneiform bones.

sively to the epiphysis of the heel-bone; hence it is apparent that if we have any disease in the epiphysis, or in the medium of union between it and the body of the bone, we shall find a great antagonist to mechanical rest in the tendo Achillis. This is the great foe with which we have to contend for the purpose of preventing any disturbance of the young bone and its epiphysis—that is, to the comparatively soft tissue situated between the epiphysis and the body of the os calcis. It is necessary, in cases of disease of, or injury to, the epiphysis of the os calcis, that the patient should keep the knee flexed for the purpose of relaxing this tendo Achillis, and so giving rest to the injured or diseased epiphysis.

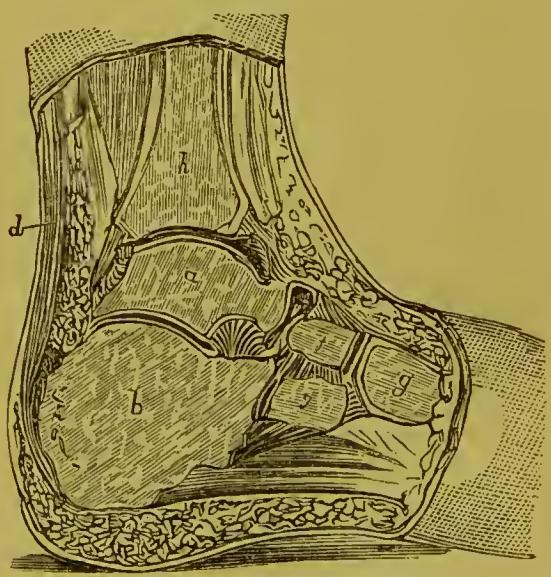


Fig. 103.—*a*, Astragalus. *b*, Os calcis. *c*, Epiphysis of os calcis. *d*, Tendo Achillis. *f*, Scaphoid. *g*, Cuboid. *g'*, Internal cuneiform.

This drawing (Fig. 103) represents part of the foot of a patient aged nineteen; there remains but little structural evidence of an epiphysis to the os calcis, although you may distinctly recognize a slight indication of it in the lower and posterior part of the os calcis; I may add that the os calcis in this foot does not seem to me to be at all well developed.

I here produce pathological evidence that the epiphysis of the os calcis is sometimes diseased and spontaneously separated. This dried prepara-

tion (Fig. 104) is, in fact, the epiphysis of the os calcis separated spontaneously from an hospital patient of mine aged about nineteen or twenty, as the result of injury to the heel, and subsequently suppuration.



104.

Quitting the foot, I ask you to notice a diagram, taken from nature (Fig. 105), showing the rough anatomy of the cervical muscles on the right side, and the same parts covered by the fascia on the left side, with the third and fourth cervical nerves descending upon the fascia to the skin covering the clavicle and the anterior part of the chest. The termination of the first intercostal nerve is also seen.

This simple nervous distribution ought to remind us of the fact, that if a patient complains of pain at this part of the chest, the cause may lie in one of two different directions. For, as nothing but these nerves can express the pain, it may depend upon disease in the cervical region, associated with the third and fourth cervical nerves; or upon some disease connected with the origin of the upper dorsal nerves (near to the upper dorsal vertebræ), or with their course towards the sternum.

The right side of the diagram represents a portion of the sternum as well as a portion of the clavicle cut away, so as to expose the sterno-clavicular articulation, composed of two articular surfaces, one of the sternum and the other of the clavicle, and separated by the interposed articular disc of fibro-cartilage. It is worthy of notice that the clavicle has but a very small extent of bony articular coaptation at its sternal end; it rests chiefly on the upper part of the sternal end of the first rib, to which it is fixed by a strong ligament. This, no doubt, is one of the reasons why, although the whole of the articular surface of the two bones, as well as the interarticular fibro-cartilage, may be destroyed by disease, yet this joint scarcely ever becomes anchylosed. To secure anchylosis you must have previous bony coaptation, and it is hardly possible to obtain this between the clavicle and sternum except as the result of destruction of all the surrounding ligaments. This, together with its mobility, is the explanation of the extreme rarity of sterno-clavicular anchylosis, and I have not been able to find a pathological specimen illustrating its occurrence in the human subject. Last summer I was at Leyden, and I looked over the rich collection of diseased bones there, but I saw nothing approaching such a specimen.

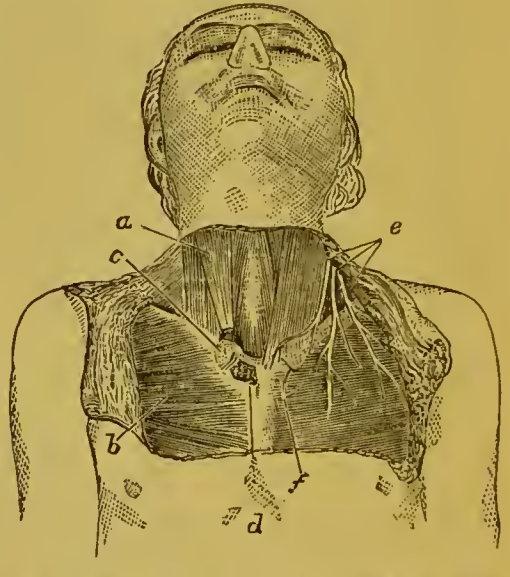


Fig. 105.—This drawing is intended to represent the anatomy of the sterno-clavicular joint, with some of the muscles capable of disturbing it when diseased; the nerves supplying the skin over it and its immediate neighborhood. *a*, Sterno-mastoid, its sternal head detached from the sternum, its clavicular portion left *in situ*. *b*, Pectoralis major attached to the clavicle and sternum. *c*, Sternal end of clavicle partially cut away so as to expose the joint between it and (*d*) the sternum, also in section. *e*, Descending branches of third and fourth cervical nerves. *f*, Termination of first intercostal nerve.

The next two cases show the value of rest in the treatment of disease in the sterno-clavicular articulation. Disease of the sterno-clavicular articulation is comparatively rarely seen in its early stage; but I have a preparation showing recent inflammation of this joint, taken from a patient of mine who died from pyæmia. When this joint is diseased it is easily diagnosed; but it is very difficult to cure, chiefly on account of its mobility, which is the consequence of its structural and functional association with the mechanism of respiration, the movements of the head and of the upper extremity, the movements of the head having reference to the action of the sterno-mastoid. With all these functions attending its anatomy, it is a very difficult joint to keep in a state of rest. I will now mention three cases of disease of this joint.

Case of Disease of the Right Sterno-clavicular Joint, cured by Rest.

In October, 1859, a man about forty years of age was admitted under my care at Guy's Hospital, with disease of the right sterno-clavicular articulation, produced, as he thought, by a strain in lifting a weight. The joint was swollen, red, and painful, discharging thin pus from an ulcerated hole in the skin (with irregular and overlapping edges), about the size of a half-crown, just below and in front of the joint. A probe could be passed along the sinus into the joint, apparently between the interarticular cartilage and the sternum, and dead or bare bone could be there detected. This condition of joint had continued for nearly a year before his admission, during which time the patient had supported his arm constantly in a sling, and was allowed to walk about. His health was good, but he had great pain in the joint whilst taking a full breath, when moving the head, especially when rotating it, and on trying to lift his right upper extremity. The treatment consisted in placing the patient in bed upon his back, with his shoulders raised upon pillows, in order to secure his chest against motion; his right shoulder, including the scapula and humerus, with the forearm, were included in a firm starch bandage, which was passed round the chest. This kept the diseased joint at rest, and left the ulcer and sinus exposed to view and free to discharge their contents. All this was done simply for the purpose of keeping the diseased parts in a state of rest. The local symptoms of disease—pain, redness, swelling, and discharge—began to improve almost immediately after we had fixed his clavicle; and in between five and six weeks a piece of the articular surface of the sternum was pushed to the orifice of the wound by the granulations, and I removed it with forceps. From that time the local symptoms rapidly subsided, and the sinus soon afterwards closed; he was then allowed to get up and walk about, still wearing the starch bandage. He continued in the hospital several weeks after this period, chiefly for the purpose of preventing him from using his right arm before the newly repaired structures were perfectly sound; he then went home into Kent, with the injunction that he was to wear his bandage for a short time longer, and to return to the hospital should he not continue well. Since then I have not heard of him.

Disease of the Left Sterno-clavicular Joint; Suppuration in the Joint; opened by Ulceration; cured by Rest.

Here is another case of the same kind, but a little more interesting in its details—a case of disease in the left sterno-clavicular joint, produced

by violence. In 1850, a gentleman, aged thirty-six, came to me suffering from a sinus and extensive ulceration in the skin and cellular tissue at the lower part of the neck on the left side near the sternum, the sequel of an abscess connected with disease of the left clavicle and sterno-clavicular articulation, which had existed during five months. I passed a probe through the ulceration and along the sinus behind the sterno-mastoid into the sterno-clavicular joint. As far as I could judge, the probe appeared to pass close to the clavicle and into the joint between the bone and the interarticular fibro-cartilage. He had been under the professional care of several surgeons during five months, whose names I do not mention, as some of them are still living. The abscess had been opened long before the time of his visit to myself; and as the ulceration and sinus, which ran under and behind the sterno-mastoid, would not heal, one of his surgeons advised, as a last resource, that the whole length of the sinus should be laid open so as to expose the deeper parts, and "compel them to heal up from the bottom of the wound." I apprehend that if the sterno-mastoid had been divided, and the sinuses had healed up from the bottom, the cure would have resulted not from any compulsion on the part of the surgeon, but from the fact that he would have given the diseased part "rest," because the sterno-mastoid was one of the great disturbing influences. Unwilling to submit to any cutting operation, the patient sought my opinion. Finding that the diseased state was simply the result of local injury, and believing that it was curable by long-continued mechanical rest, I advised him to adopt and carry out that plan, as preferable to laying the sinus open, the result of which might be uncertain.

The patient then told me the history of his case. Between six and seven months ago he had a quarrel with his coachman, whom he accused of robbing him. Soon afterwards the coachman went up-stairs into his master's private room and became very insolent to him. The result was a violent contention and personal struggle, during several minutes, for the mastery. The coachman drew an open knife from his pocket, closed upon his master with the intention of stabbing him, but the latter, a powerful man, fortunately caught hold of him round the right arm and waist, and with great effort succeeded in getting him out of the room; he then threw him right over the baluster down-stairs, and so escaped the knife. The coachman was subsequently tried, convicted of the robbery, and transported. Immediately after this struggle the gentleman found that he had damaged his left sterno-clavicular joint. From that time the tenderness, &c., to which I have alluded, began. The sterno-clavicular joint soon became inflamed, and then suppurated. The arm was carried in a sling. The discharge was considerable, and he suffered a good deal of pain on attempting to raise the left arm or take a full breath, or cough or sneeze, or turn his head abruptly. The skin was red over the joint, and the surrounding parts were much swollen. Sir Benjamin Brodie saw the patient afterwards with myself, and acquiesced in the propriety of attempting to cure him by rest. He thought the disease would be cured in that way if we could keep the parts sufficiently quiet, but that, as he observed, was not an easy matter. We subsequently, however, succeeded in accomplishing it tolerably well by the aid of a broad, leathern, well-moulded splint, which embraced and fixed the whole of his shoulder, including the scapula and the upper half of the humerus. The upper arm was further fixed in position to the side by a strap and buckle, which passed round his chest. The forearm rested in the ordinary trough of leather

which supported it and the hand. This mechanical apparatus had the effect of keeping the sterno-clavicular joint nearly, but not quite, at rest. The sterno-mastoid had still some little disturbing influence upon the diseased joint when he turned his head to the right side, or when any muscular exertion required him to make a full inspiration. I proposed to fix the left sterno-mastoid by putting a bandage or fillet round the head, and fastening it to the arm; but this he said he could not submit to. He wore the splint, &c., four or five months uninterruptedly. From the first week of local rest to the joint he began to be free from pain and to improve, and the result was, that the joint repaired itself in about eight months, when the ulcer and sinus had healed up. He continued to use the apparatus for several months afterwards, as any forcible movement of the arm hurt him at the seat of injury.

These injured parts were repaired by mechanical rest. Nothing else was done, except to attend to his general health, and to provide a proper apparatus for keeping the parts perfectly quiet. He was sent into the country to amuse himself; he used to ride a short distance with the hounds at the latter part of the season, but did not use his left arm. On the 6th of June, 1861, this gentleman called on me at my request. His belief is that he did not, as he says, "get over the accident" for nearly two years. The movements of the left arm are now the less perfect of the two; he cannot lift it so easily, or roll it backwards when raised, quite so freely as on the other side. A large, sunken, whitish, thin-skinned cicatrix is still visible over the anterior part of the sternal end of the clavicle, which is not normal in form; it is flattened anteriorly, and wider from above to below than the corresponding part of the other clavicle, and some small-pointed outgrowths of bone can be felt on the upper border of the former articular surface. The clavicular portion of the sterno-mastoid is much atrophied. On closely examining the injured joint, it is quite obvious that its articular movements are much less than on the other side. The chief structural defect seems to consist either in a loss of the interarticular fibro-cartilage or its consolidation with the clavicle, with membranous anchylosis or ligamentous union between the sternum and interarticular fibro-cartilage. Here, then, is a case of injury to the sterno-clavicular articulation, the history of which is complete, and the result as perfect as it could possibly be made by the surgeon securing that local quietude which encourages Nature's efforts at repair.

Case of Disease of the Right Sterno-clavicular Joint, produced by forcible Traction upon the right upper extremity; Death from Pyæmia (?).

A lady, rather stout, and aged between fifty and sixty, was standing on the platform of a railway station in London, and had firm hold with her right hand of the handle of a carriage door. The carriage moved suddenly and unexpectedly, and she was dragged forcibly forwards by the arm. She had some considerable pain in the right sterno-clavicular articulation immediately. A large abscess formed over and behind the joint subsequently, which received pulsations from the subclavian artery, leading to the suspicion of aneurism, and on that account I was requested to see her. It was clear that there was no eccentric expansion in the tumor, but that it was a soft fluctuating swelling, probably an abscess, receiving a distinct propulsion from behind, where it was in contact with the subclavian artery. This relieved the minds of her friends, and the lady went into the country. The abscess opened of itself, and discharged pus abun-

dantly. A splint was applied, and the arm was kept quiet for a short time. I saw the patient several times, and with a probe could detect disease of the clavicle at its sternal end, extending into and implicating the whole of the sterno-clavicular joint, where she suffered a great deal of pain. She had subsequently several attacks of bronchitis, with cough and expectoration, which disturbed the joint very much. Ultimately she died, I believe of pyæmia, after a few days' severe illness, but I could not succeed in obtaining a post-mortem examination of the case.

Disease between the first and second piece of the Sternum, cured by Rest.

The case to which I will now briefly allude is one of great interest—namely, disease between the first and second bones of the sternum. This patient, D. J——, was formerly a medical student. He was twenty-two years of age when he first consulted me in March, 1853, for pain and uneasiness about the upper and middle part of his chest. He stated that for several months he had been unable to take the least amount of exercise without considerable pain and difficulty of breathing; any attempt even at gentle motion, as in walking, full breathing, coughing, or indeed the least movement of the head or arms, was sufficient to increase his suffering. He had constant dull pain in the neighborhood of the sternum, extending towards the lower part of the back of his neck and between his shoulders, which during damp weather was of the most severe and gnawing character, accompanied with a sense of oppression and constriction about the air-passages, as though he were being choked. Any attempt to take a deep inspiration produced pain in the same part. Pressure made with the hand upon the front of the chest during expiration was attended with pain of the most severe and lancinating kind. He jumped and started in his sleep, and was disturbed by frightful dreams. His appetite had failed during the last few weeks, but he did not appear to have lost much flesh. He had consulted many eminent physicians and surgeons in town and country, but could not learn from them any distinct cause of his suffering. He had been leeched and blistered over the chest and spine, and had passed in succession through the ordeals of boating, cricket, quoits, and gymnastic exercises; indeed, every possible kind of treatment appeared to have been pursued, but without benefit, and he was now worse than ever. I might say that he had not been previously examined carefully with respect to the sternum or spine. The physicians and surgeons who saw him were satisfied to take his indications of pain, as he was a professional man. I suppose they did not think it worth while to examine the sternum, where the real mischief was found. I examined his spine very carefully, but could not discover anything wrong there. His breathing was regular and natural, but limited in its extent by pain in his chest; the heart's action was normal. There was acute pain on percussing the chest; and on approaching the middle line in front, the pain, by pressure upon the sternum, was much increased. On placing my thumb directly over the junction of the first and second bones of the sternum, and exerting slight pressure upon that part, the pain was so intense that he nearly fainted. It was evident that the secret of all his morbid symptoms lay in this joint,* and indeed there was some enlargement and thick-

* The two upper pieces of the sternum are usually described as united by cartilage, bony union being rare save in late old age. Mr. Rivington, Med. Chr. Trs., vol. lvii., has drawn attention to the fact that two forms of joint are found here, the amphi-arthrodial, and the arthrodial or gliding variety of the diarthrodial joint.—[Ed.]

ening there. Upon close interrogation as to the probable cause of all this, he said he could remember three years ago having received, during a sparring contest, a very violent though friendly blow upon the part now affected, although it was not until several months afterwards that he experienced any severe pain. Finding a diseased joint in this patient, and bearing in mind the means he had already employed without benefit, it appeared to me that everything had failed in consequence of the sternum not having been kept quiet. I directed him to return into the country; to lie upon his back for six months; to apply two or three leeches to the tender part of the sternum; to encircle the chest with a bandage so as to limit motion in the ribs, and so in the walls of the chest; to use no exertion of any kind which required prolonged or violent respiration; to keep the sterno-mastoids relaxed; not to do anything with the upper extremities which would require the sternum and ribs to become the fixed points of the pectoral muscles; to take sufficient morphia to insure a good night's rest; and to live upon plenty of nutritious food.

The terms I have employed in enumerating and describing the symptoms of this case perhaps hardly give a correct expression of the severity of the patient's symptoms. He really was absolutely miserable; he could not stand, he could take no exertion, he could not cough or talk aloud; he could scarcely do anything without great suffering.

At the expiration of four months of absolute rest, he had so much improved that he believed himself capable of pursuing his usual duties (which were of a light character), and this he continued to do until the end of 1859, at which time I saw him again. All tenderness of the sternum upon any amount of pressure had subsided. In writing to me soon afterwards, he states that he is confident that had he carried out the plan of absolute rest for the six months as I enjoined him, he would have been well by that time; and that although he took in every other respect the greatest possible care of himself, his recovery was prolonged by getting up too early. In January, 1860, he wrote this note:—

"My dear Sir,—I enclose you some notes of my case, and you are at liberty to use them as you think fit. I may now tell you that I consulted five London and two provincial hospital surgeons, and three London hospital physicians, previously to my interview with you. The boating was ordered by a physician, and other athletic sports by the London surgeons, and certainly they played the very devil with me. I shall never forget tugging off to the Isle of Man for a month to have plenty of rowing. You can imagine my state on my return home. My condition for many months was most intense and painful misery. I am satisfied that, had I not followed your advice, nothing short of an opening and exfoliation, and God only knows what, would have been the result."

This case will be satisfactory, I think, as pointing out the importance of examining the part where the pain was complained of, while, at the same time, it displays the value and importance of mechanical rest in cases of this kind.

Before concluding these lectures on the therapeutic influence of rest in its relation to the treatment of diseased joints, I am desirous of placing before you a familiar illustration of the inexplicable good which arises from due rest in cases of over-fatigue to joints by exercise or muscular exertion.

Two persons start upon a pedestrian tour, and after walking a certain number of miles, feeling fatigued, they seek relief by lying down and going to sleep. After a repose of an hour or two, with perfect rest of

mind and body, but especially of body, they rise invigorated, "giants refreshed," and proceed on their journey with renewed strength, and apparently without the slightest inconvenience. Now, what have they obtained during the period of repose? Anything or nothing? No food has been taken, and therefore no strength has been obtained by the addition of any new material to the system. The hypothesis is, that the various enfeebled structures have had time and opportunity by rest to become invigorated by selecting and appropriating to themselves, in the form of nutrition, new material from the capillary circulation, which is proceeding within or near them.

Let us, for the purpose of pursuing the inquiry, modify the illustration by the supposition that, although both pedestrians are much fatigued by walking, only one of them takes his rest, and that the other proceeds on his journey, notwithstanding his fatigue.

The one continues walking, and, after going some considerable distance, at length arrives at his much-wished-for resting-place. When his friend, who has been taking his rest in the middle of the day, overtakes him, he (the one in front) is found to be the subject of a painful condition, or possibly of an inflammation of the ankle, knee, or hip-joint. What has occurred in the one case, and not in the other? The one, wearied by his exertions, lies down and takes his rest, and suffers no harm; the other, while still under the influence of fatigue, continues his journey, and he is the subject of a joint-inflammation. What, I ask, has really happened to him who suffers? We must assume that there has been in his case a temporary physiological exhaustion of the various structures which have been especially concerned in walking. We may presume that the synovial membrane no longer secretes its proper lubricating fluid; that the elasticity of the articular cartilage is for the time much reduced; that the same kind of deterioration in function may probably be present in the bones themselves; that the ligaments are no longer capable of resisting the effects of either misplaced steps or unsteadiness of gait; and that the muscles being wearied and fatigued, the person has not had the advantage of that muscular adjustment which would have secured his joints from the ill effects of any jar or sudden concussion as he walked.

The influence of this latter condition (which we may, I think, term "muscular adjustment") you will recognize at once, when I remind you of what often happens when walking in the dark. If you abruptly meet with a little descent of only two or three inches, and your foot comes down unexpectedly without your having prearranged or nicely adjusted your muscular force, the patella may be broken, perhaps, or the whole body receives a momentary shock from the rapid transit of the vibration through it. The influence of the shock is felt even in the brain, inducing temporary confusion, and causing sometimes a slight stinging, electric-like sensation upon the face throughout the distribution of the sensitive part of the fifth nerve—sometimes, indeed, the tongue is bitten.

Whence this sudden discord in the action of the various structures hitherto employed in harmonious co-operation, which permits this rude and harsh concussion of the whole frame from so small an error in progression? The bones, the synovial membranes, the articular cartilage, the ligaments, are all in a state of integrity. The only peculiarity is, that the muscles have been taken by surprise, and have not had the opportunity of giving that aid in the fall which they would otherwise have done, and so preserved the person from the concussion from which he has suffered, but which he would have escaped had he been aware of the

sudden descent, or had he been alive to the correct measurement of the distance.

Allow me to put before you another illustration of the same state. You may see a man, full of confidence in himself, jump from a height of two or three yards, alight upon his feet, and walk away unhurt; while another person, or the same person at another period, timid and afraid, or without a fixed purpose, falls suddenly and unexpectedly, or jumps, under the influence of fear or doubt, a comparatively short distance, not maintaining his mental equilibrium, "loses his head," as it is called, and comes down upon his feet, confuses his brain by the shock, and perhaps sustains a fracture or dislocation at his ankle, a broken leg or thigh.

What has been the cause of these different results? Simply that the one who had his mind "always about him," his nervous centres alive to his impending necessities or requirements, has had the advantage of keeping up and controlling his muscular adjustment, so as to prevent any shake to the brain or serious injury to any of the bones or joints. This seems to me to be the result of instinctive muscular adjustment.

Now, to go back to the application of this rather long digression. The pedestrian who walked on at the time when his friends stayed behind for the purpose of repose, proceeded on his journey in a state of fatigue and muscular exhaustion, so that the joints had not, during the period of their prolonged exercise in walking, the advantage of muscular adjustment to modify the effects of concussion upon the joints and ligaments. Under such circumstances, the joints become the subjects of violent concussion or vibration, vascular congestion, and then inflammation. There is no apparent or recognizable lesion of structure; but the pliability or elasticity of the foot is gone, and the joint is stiff, and will not bear concussion. The elasticity of the articular cartilage, however, is only temporarily diminished, for the renewed capability of bearing weight and concussion in a few hours indicates structural recovery. Carry this inquiry one step further. Instead of taking his onward course on the following day, the person whose foot or ankle-joint is inflamed lies up during a day or two, resting and elevating his leg and foot, and using a bandage and cold water. Now the foot and leg are to be raised. What is the object of this elevation of the foot? What does it mean? It simply means emptying the capillaries—giving them rest, freeing them from their state of congestion, and thus allowing them by "rest" to return to their natural and vigorous condition. Ought not this typical expression of Nature's high appreciation of rest to form a safe guide and direction for the surgeon in many of the cases to which his attention may be called? I say, Yes! Is it so regarded, or is such a physiological line of thought and action manifested so often as it ought to be by the surgeon in his recommendations or his practice? I say decidedly, No!

I have indicated to you that accidents and diseases of joints occur from over-walking and over-straining, from rude progression, from some twist, muscular fatigue, or some other casualty. The three drawings (Figs. 106, 107, 108, and 109) have reference to this point.

Case of severe Inflammation of Right Ankle-joint and Foot, followed by Suppuration; complete Dislocation of the Foot; cured by Rest.

This drawing (Fig. 106) represents the right foot of H. B——, who at sixteen years of age was admitted under my care at Guy's Hospital on

March 26th, 1855. He was previously quite well, but fatigued, when he determined to walk from Southwark to Enfield on the morning of March 21st, 1855, although he had pain in his foot when he reached Graecchurch Street on his way. When he arrived at Enfield his foot and ankle were swollen. He sat indoors all day, and in the evening went to the railway station supported by two men. At night he could not bear the slightest weight upon his foot, and the ankle was much swollen. Cold lotions were applied to the painful and swollen parts, and some medicine given. He came to Guy's Hospital on the 26th, five days after the attack, suffering most severely with acute inflammation within the ankle-joint, and at the outer side of the foot over the os calcis and cuboid bone. Leeches were applied abundantly, and poppy fomentations. The leg was elevated upon a pillow, and supported laterally by sand-bags. Extensive suppuration took place near the external malleolus. This was opened in a fortnight from the accident. The integuments were disposed to slough. Hemlock poultices were applied. A week after this opening was made, some ulceration of the skin occurred, and the foot became completely dislocated inwards from the tibia, so as to expose to view the top of the astragalus, as well as the articular surfaces of the tibia and fibula.

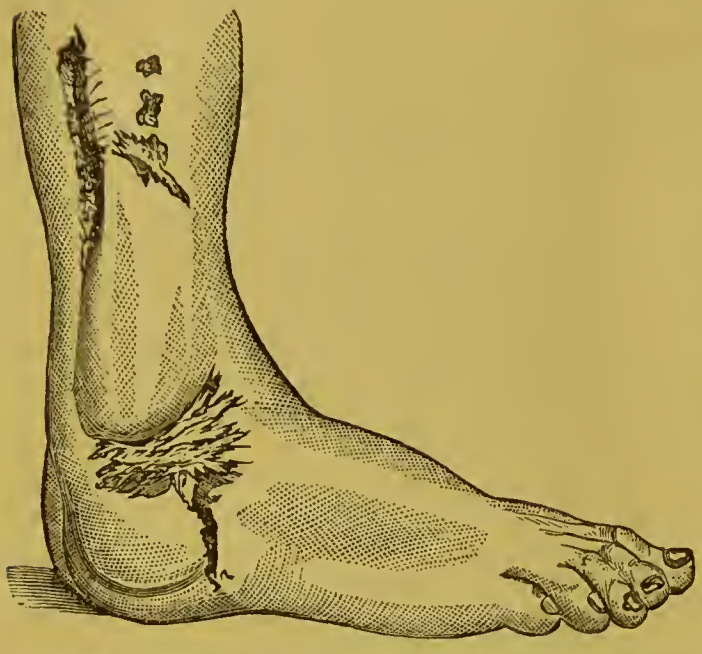


Fig. 106.—This drawing represents H. B——'s right foot and leg as it was in 1861. The dark stellate spaces mark the sites of the cicatrices—long since healed up. It is noticeable that the heel is very short, and the whole foot smaller than the left. This latter fact is illustrated by the accompanying ground-plans.



Fig. 107.

Here I might add, as a matter of interest, that this boy's ankle-joint being completely exposed to view, I took occasion to touch with my finger the exposed, inflamed, and partially ulcerated articular cartilage. He felt no pain; but when I pressed hard upon either the articular surface of the astragalus or the tibia, it gave him a great deal of pain; clearly indicating that the pain was not associated with simple ulceration of the cartilage, but had reference to the deep pressure upon the subjacent parts.

Chloroform was inhaled, and I reduced the dislocation; but thinking it safer for the patient, I divided his tendo Achillis, for the purpose of preventing any displacement by the action of the gastrocnemii, which were frequently in a state of spasm. Splints were then applied, and the diseased leg was swung. He remained in Guy's nearly eleven months,

and then went out for six weeks, when he returned because his foot had become swollen, red, and painful, from improperly using it; in fact, the new or repairing young bone was not at that time equal to the claims and exigencies which had been thrown upon it. Subsequently he had frequently slight attacks of inflammation in his foot from over-exertion in standing or walking. He used to say, "I only come to the hospital to lie up;" and he availed himself of the privilege rather frequently. His mother, getting quite tired of these repeated hospital visits, wished me to take off his leg; but I preferred to wait and see the result of Nature's efforts at repair.

Well, here is the result (Fig. 106). Three or four pieces of dead bone came away from the os calcis, and probably the cuboid. I saw him in May, 1861. He considers that his foot and leg have been well for three years. He can walk any reasonable distance, and stands at his work—hat and cap making—not unfrequently for fifteen hours a day. This is a good case, fairly representing bloodless conservative surgery, and indicating that although a great amount of local injury may occur as the result of over-fatigue, it is capable of being entirely recovered from.

The next case is one of great interest.

Injury to the soft Structure uniting the Shaft of the Tibia to its lower Epiphysis, followed by Ostitis and Sub-periosteal Suppuration; Death in Twelve Days.

A young gentleman, eighteen years of age, tolerably healthy, and living at Islington, was always active and fleet of foot. On Friday, Jan. 10th, 1862, he ran two miles right off to a friend's house, and, after resting for a short time, he ran back two miles home, but suffered no known inconvenience from that exertion. On the Sunday evening following, returning from chapel, wearing a very narrow, high-heeled boot, and walking at the edge of the pavement, his left foot turned inwards with a sudden jerk or twisting sensation, and he exclaimed to his sister, who was with him, "Oh! I have twisted my foot; I never had such a dreadful wrench before." He walked home, and, excepting at the time of the strain, he felt but little of the injury during that evening or night. He walked to his business—ten minutes' walk from his own home—on Monday morning, when the pain in his leg near the ankle became so great that he could not remain, and he returned home; he limped, and could scarcely bear any weight on his foot. His mother fomented his ankle, used hartshorn and oil to it, applied vinegar, and gave him an aperient. She nursed him through Tuesday, Wednesday, and Thursday, when his surgeon was called in about mid-day. The patient could not then bear any handling of his ankle; he cried with pain, which he referred to about two inches above the internal malleolus and across the tibia in a straight line; there was some swelling at that part, but no ecchymosis or other discoloration. The pain on pressure, with a doubtful crepitus, made it appear probable that it might be a simple fracture of the tibia. The pain continuing on Friday, his surgeon ordered four leeches to the part. Soon after this a severe rigor came on. I saw him on the Sunday, with Dr. Billinghurst, and I then came to the conclusion that he had sustained some injury to the epiphysis; for upon close examination I found the ankle-joint free from mischief. A little careful manipulation enabled me to isolate the injury to the tibia, and I told Dr. Billinghurst that I believed the soft parts between the shaft and the lower epiphysis of the tibia were injured. At

that time the patient was suffering extreme pain, and he had a small collection of pus deep in the leg at the inner and back part of the tibia. I did not again see this patient alive. Five or six days afterwards he died with what was thought to be typhoid fever.

By chance, on the day before the funeral, I heard of his death. I immediately wrote to his relations, and obtained permission to make an examination of the leg. I went to the house early on the following morning; the hearse was at the door, so that I had only time to unscrew the coffin and examine the leg. I found the soft parts around the injured bone, external to the periosteum, infiltrated with serum, but there was no evidence of any laceration of these structures; no bruised appearance, no extravasation of blood. The periosteum was separated from the inner, anterior, and posterior parts of the lower portion of the tibia by a considerable collection of pus, which was confined in its position by the periosteum.



Fig. 108.

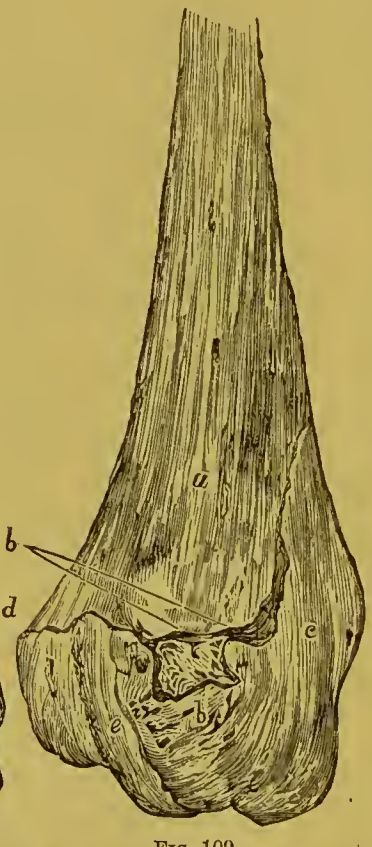


Fig. 109.

These figures represent two views of the lower portion of the tibia, drawn from the preparation.

Fig. 108.—*a*, Vertical section of the inner aspect of the left tibia, inflamed, mottled in appearance, and somewhat softened. *b*, Portion of tibia tolerably healthy in structure (corresponding with *c*, Fig. 109), upon which the periosteum is still firmly fixed. *c*, Section of epiphysis inflamed. *d*, Section of the soft medium of union between the shaft and epiphysis. *e*, Portion of this uniting medium destroyed, leaving a gap continuous with *d*, Fig. 109.

Fig. 109.—External surface of the same portion of tibia. *a*, Portion of the tibia deprived of its periosteum by sub-periosteal suppuration. *b*. Inner malleolus. *c*. Portion of periosteum still adhering to the bone, and extending from the epiphysis to the shaft of bone. *d*, Seat of injury to the medium of union between the epiphysis and shaft, leaving a considerable gap or cavity between them. *e*, Groove for the tendon of the tibialis posticus muscle.

The lowest part of this collection of pus corresponded with the injury to the epiphysis depicted at *d*, Fig. 109. The fibula was not injured, nor was the interosseous ligament between it and the tibia. No suppuration nor any evidence of inflammatory condition within the ankle-joint existed. I took away this bit of the tibia, and it fairly remunerated me for my trouble. These drawings (Figs. 108 and 109), were made from the preparation on the same day that the piece of bone was obtained. This preparation is a longitudinal section of the tibia, showing the inflammatory condition of the whole interior of the shaft of the bone, and also of the epiphysis. There is, as you may see, a distinct gap from inflammatory softening and absorption, or laceration, between the shaft of the tibia and its lower epiphysis. This is precisely the spot where the boy had the

first sense of injury on the Sunday evening; it was near to that spot that he complained of pain when Dr. Billinghurst first saw him. In this instance we have distinct evidence of an injury having occurred from violence to the soft structures between the shaft and epiphysis of the tibia, followed by death—I believe from pyæmia—twelve days after the accident.

These lectures, from the mode of their delivery, have been of necessity fragmentary. Their object has been to establish a principle; and how difficult a matter of attainment this is in medical science we need not be reminded.

I have herein endeavored to show that "Rest is a most important therapeutic agent in the cure of accidents and surgical diseases." To illustrate the varied applications of this principle, I first surveyed, as fully as my limits permitted, the marvellous contrivances which Nature has employed for securing rest to the different organs of the body when in health. I then depicted the instinctive promptings of Nature to secure Rest on the occurrence of accident or disease. Lastly, I attempted to shadow forth the different appliances for the attainment of Rest with which that surgeon only will become familiar who has an accurate knowledge of the anatomy and physiology of the different parts which he may be called upon to treat.

I have also endeavored to impress upon you the fact, "*that every pain has its distinct and pregnant signification, if we will but carefully search for it.*" To the extent of my present opportunity I have striven, by the agency of a more precise nervous anatomy, to unravel and render patent the meaning of pains which have been so often described as *anomalous or obscure.* From the pain which follows the intrusion of a particle of dust on to the conjunctiva, and the closure of the eyelid for the security of rest, up to the most formidable diseases we have to treat—pain the monitor, and rest the cure, are starting-points for contemplation which should ever be present to the mind of the surgeon in reference to his treatment. Feeling that I have, at most, advanced but one short step towards the object of every scientific surgeon, I trust I have neither dogmatized nor spoken presumptuously. A like idea was doubtless present to the mind of Dr. Darwin when he wrote the preface to his "Zoonomia." "A theory," he says, "founded on Nature, that should bind together the scattered facts of medical knowledge, and converge into one point of view the laws of organic life, would thus on many accounts contribute to the interests of society. It would capacitate men of moderate abilities to practise the art of healing with real advantage to the public, it would enable every man of literary attainments to distinguish the genuine disciples of medicine from those of boastful effrontery or of wily address, and would teach mankind in some important situations the knowledge of themselves." I may also adopt his quotation from Cicero, changed into the past tense, because it so exactly expresses my feelings:—"Hæc, ut potui, explicavi: nec tamen, ut Pythius Apollo, certa ut sint, et fixa quæ dixi; sed ut homunculus unus ex multis, probabiliora conjectura sequens."

APPENDIX.

Case of Dislocation of both Thigh-bones from Disease of the Hip-joints; one Femur being displaced on to the Dorsum Ilii, near to the Ischiatic Notch; the other dislocated downwards, below the level of the Acetabulum, and close to the Foramen Ovale.

K. S., a girl aged fourteen, was admitted into Charity ward, under my care, in July, 1864. The child was greatly emaciated, and daily growing weaker from a large amount of thin purulent discharge, which came from numerous sinuses communicating with the hip-joints. The head of the left femur was distinctly felt and seen upon the dorsum ilii, the left leg lying across the right thigh just below the level of the pubes, and pressing the right thigh down into the bed, so that it became difficult to ascertain what had happened to the head of the right femur. This, after chloroform had been given, was found lying deep below the right acetabulum, in the neighborhood of the foramen ovale. In the hope of improving the general health, any attempt at reduction was deferred for about a fortnight, when, under the influence of chloroform, the reduction of the left femur was accomplished without much difficulty. A straight splint was applied, extending from near the axilla, along the outer side of the thigh, to the foot. Owing to the exhausted state of the patient, steps for restoring the position of the right thigh were deferred for nearly a month more, when chloroform was again given, and the limb having been rotated, the head of the bone was lifted up from its deep position, and then replaced in the acetabulum. A straight splint was applied as on the left side, and thin pillows placed between the legs. The health of the patient was restored rapidly, the discharge from the sinuses becoming less and less until it almost ceased. The splints were removed occasionally for the purpose of cleanliness. After about four or five months of rest, comparative fixity of the joints became apparent, and ultimately the anchylosis was perfected in both limbs, and in good positions. On being allowed to get up, the patient was able to stand without pain. Gradually she gained more and more power, and used to shuffle about the ward swinging her trunk upon the pelvis, anchylosed to the femurs.

She left Guy's Hospital in April, 1865, to go to the Cripples' Home, getting about on crutches. She remained here two years, and left to go to a dressmaking establishment in Kilburn. At this time she walked very well, and without crutches. All inquiries at the present time (1876) to ascertain her whereabouts have ended in failure.

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